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THE CAUSE OF KERATITIS AFTER GASSERIAN GANGLION OPERATIONS.

F. H. VERHOEFF, M. D.

BOSTON, MASS.

The writer believes the lesion here considered is essentially an exposure keratitis, arising when there is deficiency of lacrimal secretion. In six cases recently observed with reference to this the secretion could not be detected. The importance of the seventh nerve in the innervation of this gland is pointed out; and this nerve may be injured in Gasserian ganglion operations. In one case, treated in accordance with this hypothesis, healing was rapid.

As is well known, after operations upon the Gasserian ganglion, or its sensory root, for the relief of trigeminal neuralgia, keratitis of a serious nature may occur. At first the cornea shows simply lack of luster. Then there is exfoliation of the epithelium, usually just below the center of the cornea. This increases in extent, more or less infiltration of the stroma occurs, and finally, if the process continues, the cornea becomes deeply infected and may undergo perforation.

This condition is generally regarded as a form of neuroparalytic keratitis. Various theories have been brought forward to account for it, none of which is free from serious objections. At one time I believed it to be simply a type of neuropathic keratitis related to that of herpes zoster or herpes febrilis; and dependent, as maintained by Wilbrand and Saenger,[1] upon an irritative lesion of the fifth nerve, or Gasserian ganglion. More extensive observations, however, soon caused me to abandon this view.

I am now convinced that the condition is essentially an exposure keratitis; chiefly because in cases of Gasserian ganglion operations I have never observed typical dendritic or punctate corneal lesions and because, so far as the appearance of the cornea is concerned, the keratitis cannot be distinguished from exposure keratitis. It is probable, however, that in cases of herpes zoster a keratitis may exceptionally develop which is in all respects similar to that following Gasserian ganglion operations and which is dependent upon a similar cause.

One of the theories is that the keratitis is the result of drying of the cornea owing to infrequent winking and diminution of the lacrimal secretion. It is assumed that the lack of lacrimal secretion is due either to the absence of reflex stimuli from the anesthetic eye, or to the abolition of the secretory nerve impulses thru the fifth nerve. The fatal weakness of this theory lies in the fact that according to it the keratitis should be far more frequent than it actually is, that is, its occurrence should be the rule instead of the exception.

The resemblance of neuroparalytic keratitis to xerophthalmia is remarkably close. The latter is now believed to be due to deficiency of lacrimal secretion, dependent on changes in the lacrimal gland, resulting from lack of fat soluble vitamin in the diet. The one important difference between the two conditions is, that in xerophthalmia there is keratosis of the conjunctival and corneal epithelium, which gives a greasy appearance to the eye. This difference may be dependent solely upon the slower onset of xerophthalmia. Thus in pemphigus and old trachoma, in which the lacrimal secretion is slowly cut off by occlusion of the lacrimal ducts, keratosis also occurs.

Dryness of the eye is generally recognized as a feature of neuroparalytic keratitis. Recently I have observed cases of keratitis after Gasserian gang-

lion operations, with special reference to the presence or absence of lacrimal secretion, and in six consecutive cases I have been unable to detect any such secretion. The eyes do not appear to be absolutely dry, evidently due to oily and mucous secretion from other glands, but no tears can be detected. Even after blowing smoke into the sound eye no tearing results in the affected eye. In two cases in which the patients cried, no tearing occurred on the affected side. On the other hand, of seven patients without keratitis who were available for examination, tears were demonstrated on the affected side in each, altho the cornea was completely insensitive.

The secretory nerve supply of the lacrimal gland has never been completely determined. Anatomic, experimental and clinical observations have all led to conflicting conclusions in regard to it. However, it seems certain that the seventh nerve supplies secretory fibers to the gland. As to whether or not the fifth nerve does also, the evidence is highly unsatisfactory. To me, however, the mere fact of the large size of the lacrimal branch of the fifth nerve is almost conclusive proof of its secretory function. It has been suggested that the psychic impulses that cause crying are conveyed by the seventh nerve. This view seems probable owing to the fact that the act of crying is accompanied by contraction of the facial muscles. Experimental and clinical evidence indicates that the secretory fibers from the seventh nerve pass into the large superficial petrosal nerve which leaves the seventh nerve at the site of the geniculate ganglion and passes beneath the Gasserian ganglion to reach the sphenopalatine ganglion thru the Vidian nerve. From this ganglion the fibers run to the lacrimal gland via the zygomatic nerve. Edward Jackson[2] has called attention to the similarity of this arrangement to the innervation of the salivary glands by the chorda tympani nerve. An attractive theory, which, however, has no real evidence to support it, is: that the orbital portion of the lacrimal gland is supplied by the fifth nerve, while the palpebral portion is supplied by the seventh. The evidence seems to be against the possibility of innervation of the gland thru the cervical sympathetic.

Francke[3] in 1895 reported a case of spontaneous complete paralysis of the seventh and eighth nerves without involvement of the fifth. There was diminution of lacrimal secretion on the affected side altho the eye "etwas in Thränen schwimmt." In crying the eye showed no increased tearing. Francke drew the conclusion that the lacrimal gland is supplied only by the seventh nerve and suggested that diminution or suppression of the lacrimal secretion after extirpation of the Gasserian ganglion is due to injury to the large superficial petrosal nerve. Krause[4] accepted this conclusion, but neither of these observers applied it to the explanation of neuroparalytic keratitis. It seems to me, however, that Francke's case only indicates that the seventh nerve sends secretory fibers to the lacrimal gland; and does not exclude the possibility that the fifth nerve also takes part in the secretory innervation of the gland, for it is evident that there was considerable secretion of tears in the affected eye.

After operations upon the Gasserian ganglion, or its sensory root, it sometimes happens that more or less complete facial paralysis results. Just how the paralysis is produced has never been definitely determined. It is evident, however, that if the facial nerve can be injured, its secretory fibers to the lacrimal gland can also be injured, either within the main nerve stem, or, still more easily, within the large superficial petrosal nerve, in its course directly beneath the Gasserian ganglion. Moreover the secretory fibers could sustain or escape injury, with or without facial paralysis.

If we assume, therefore, that in certain cases of operation upon the Gasserian ganglion, the nerve impulses to the lacrimal gland thru the seventh nerve are thus abolished, we have a satisfactory theory of the keratitis which sometimes occurs. For in such cases

there would be complete cessation of the lacrimal secretion, since the function of the secretory fibers of the fifth nerve, if they actually exist, would also be abolished by the operation.

This theory, unlike any hitherto advanced, is consistent with the fact that corneal involvement does not occur in the majority of operative cases, since only exceptionally would the entire secretory nerve supply of the lacrimal gland be interfered with. Probably it is applicable to all typical cases of socalled neuroparalytic keratitis due to other causes, such as trauma, tabes, etc.

In cases in which keratitis does not develop, in spite of the eye apparently showing no lacrimal secretion, we must assume that the secretion has simply been diminished. In cases in which keratitis develops very late, the same explanation may apply, or the keratitis may be of a different nature; in some cases, possibly being due to actual trauma to the cornea. In cases of facial paralysis from lesions above the geniculate ganglion, without involvement of the fifth nerve, in which keratitis does not occur, we must assume either that the secretory fibers of the seventh nerve have not been completely paralyzed, or that the fifth nerve has a secretory function. The latter assumption seems to me the more probable.

This theory is of practical importance to the surgeon in its suggestion, that he should endeavor as far as possible, to avoid injury to surrounding structures when operating upon the Gasserian ganglion. As regards treatment, it suggests the frequent irrigation of the affected eye with a solution similar to lacrimal secretion. In the single case in which I have had opportunity to carry out such treatment, the latter was highly successful. In this case for three months after the operation the eye had always appeared dry and the cornea stippled, but there had been no loss of epithelium. Then the patient returned with the eye greatly congested and the cornea denuded of three-fourths of its epithelium. An apparatus was devised which kept the eye constantly moistened with Ringer's solution. No bandage was employed. Within forty-eight hours the corneal epithelium was completely restored; but the apparatus then failed to function and the epithelium again came off. After trying other measures during several days without success, I kept the conjunctival sac filled with an ointment consisting of vaselin 62 gms., Scharlach R. 10 gms., Ringer's Solution 28 c.c. Both eyes were bandaged. Within three days the corneal epithelium was restored. After this the integrity of the epithelium was maintained by simply dropping Ringer's solution into the eye every two hours during the day. This treatment would seem to be especially valuable in those cases in which the lacrimal secretion is abolished for a short time after operation, and then returns.

233 Charles St.

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BILATERAL ACUTE SEROUS TENONITIS.

RAYMOND J. SISSON, M. D.

DETROIT, MICH.

This case studied in the Massachusetts Eye and Ear Infirmary ended in recovery. The differential diagnosis between serous tenonitis and other conditions that might cause similar symptoms is carefully worked out.

In a review of the literature on the subject of tenonitis it was obvious that many of the reported cases were incompletely worked up. The condition is rare, but I believe that many cases occur which are incorrectly diagnosed. In the case which I have to report all other conditions have been, apparently, ruled out.

Fig. 1. May 4, 1924, seventeen days after onset of present illness. Exophthalmos in both eyes to a marked degree. The chemosis of the conjunctiva is very marked in the left eye; in the right eye is it less so.

Fig. 2. May 4, 1924. Lateral view showing chemosis and exophthalmos in the left eye.

CASE. M. H., female, aged 25, entered the Massachusetts Eye and Ear Infirmary May 3, 1924. Family history, negative. Vision in the right eye was always poor. The eyes were always slightly prominent. The patient stated that from the age of 5 to 8 a strabismus was present. She was always well until March, 1924, at which time she had a severe tonsillitis, the duration of which was one week. There had been no loss in weight, no tremor, nervousness, palpitation, dyspnea, chills or temperature.

Present illness: The onset April 17, 1924, was with sharp pain in the right eye and supraorbital region on looking to the left. April 19th a gastric upset occurred, for which condition she entered a local hospital. During her convalescence from this condition she noticed a bright red spot over the insertion of the right internal rectus muscle. The right eye became more red; and a dull continuous pain was present in the right eye across the right supraorbital region. Edema of the conjunctiva and exophthalmos, began and progressed to the stage seen on entrance. Restriction of motion was observed in the right eye during this period. The left eye began to become red four days prior to entrance, edema of the con-

junctiva, exophthalmos and restriction of motility the day before entrance. The patient states that there was diminution of vision in both eyes from the time of onset.

Physical examination: A well nourished female, lying quietly in bed. The sinuses transilluminate well, no evidence of infection in nose. The tonsils are moderately hypertrophied, the teeth show marked pyorrhea; and there are two devitalized teeth with a draining sinus from one. The thyroid is not enlarged. No glandular enlargements. The heart, lungs and reflexes are normal. Pulse 78. Temperature 98 4/5°. Respiration 18. Blood pressure 135/75.

Right exophthalmos 23 mm. with exophthalmometer. Marked conjunctival edema and redness especially involving the lower palpebral portion, so that an eversion of 7 mm. of conjunctiva is present. The remaining palpebral and bulbar conjunctiva is red and edematous but to a lesser extent. The tension is 12 mm. (Schiötz.) A slight divergence of the right eye is present. There is no ocular motility in any direction. The cornea, media and fundus are normal. Vision 20/100. With +0.50⌒3.50 ax. 180°=20/70.

Left: Exophthalmos 28 mm. Conjunctival edema and redness greater than in R. The conjunctival eversion of the lower lid measures 15 mm. There is no ocular motility except very slight motion upward. Tension 12 mm. (Schiötz.)

Vision, 20/50. With +1.00 sph. = 20/40.

Laboratory Findings: The blood Wassermann and urine were negative, the white blood count 10,200. Polymorphonuclear leucocytes 70%, small lympocytes 26%, large mononuclear leucocytes 3%, eosinophils 1%. X-ray of sinuses was negative. X-ray of the teeth showed two which were abscessed. Basal metabolic determinations at the Massachusetts General Hospital showed a result of minus five.

CLINICAL COURSE.

The diagnosis of serous tenonitis was made, and the patient was put to bed. The diagnosis was also independently made by Dr. F. H. Verhoeff, who saw the patient the day after admission. Sodium salicylate and sodium bicarbonat, dosage grains 20 of each, were given every three hours; and after the physiologic effect was reached the doses were varied to maintain this effect. Fluids were forced to 2,000 c.c. a day. Cold magnesium sulphat compresses (saturated solution) were used for a period of twenty minutes every hour. Boric acid ointment was used, to keep the exposed cornea and conjunctiva covered at all times. The two abscessed teeth were extracted May 7, 1924. Each showed pus at the apex.

Fig. 3. June 21, 1924, 65 days after onset. The exophthalmometer reading is almost normal. The conjunctival edema has entirely disappeared. The divergence of the right eye is apparent.

The tonsils were removed May 13, 1924. Pathologic examinations by Dr. F. H. Verhoeff showed chronic inflamation with hyperplasia.

Beginning May 12, 1924, the exophthalmos decreased slowly, and the full motility of the ocular muscles slowly returned, the protruding conjunctiva receded to assume its normal relationship. There was also improvement in vision. The improvement started in the right eye, and in the left eye three

days later. On discharge from the hospital May 26, 1924, the exophthalmos measured R., 20 mm.; L., 22 mm.

Vision: R. 20/70;+1.37⌒+0.62 ax. 180°=20/50.

L. 20/20;+0.50 sph. = 20/15.

The conjunctiva of L. was still somewhat red and thickened.

June 21, 1924. No pain or irritation. The conjunctiva is very slightly thicker than normal. Motility unrestricted in all directions. Exophthalmos R. 20 mm., L. 22 mm. Divergence R. 25 degrees.

DIFFERENTIAL DIAGNOSIS.

The following must be considered:

(a) Panophthalmitis.
(b) Orbital cellulitis.
(c) Thrombosis of cavernous sinuses.
(d) Acute Graves' disease.
(e) Sinusitis.
(f) Trichinosis.
(g) Chronic nephritis.

(a) In panophthalmitis visible suppuration within the eye would make the positive diagnosis.

(b) It would be inconceivable that a process of such character, as to produce the acute symptoms present in this case, would exist without a leucocytosis, or rise in temperature, and go on to complete recovery. Fuchs states that bilateral orbital cellulitis is one of the greatest rarities.

(c) With thrombosis of the cavernous sinuses there would be venous hyperemia of the retina, associated with venous distension, and retinal hemorrhages. The entire picture would be associated with severe cerebral symptoms terminating in death.

(d) Acute Graves' disease is accompanied by a history of recent loss in weight, tachycardia, tremor and nervousness. Examination would show exophthalmos and associated palpebral signs, extreme nervousness, especially if of such marked degree as to cause a condition of such an acute and severe nature as in this case. There would also be a high pulse pressure, accentuated first cardiac sound and increased basal metabolism. Once the exophthalmos had occurred it would not recede.

(e) The ethmoid and sphenoid sinuses could give a similar picture, but they were ruled out by clinical and X-ray examinations.

(f) Trichinosis of extreme severity might give a similar picture but this was ruled out by history, absence of eosinophilia and the presence of normal temperature.

(g) In chronic nephritis there would be urinary and fundus findings, with elevation of blood pressure.

COMMENT.

Fuchs states that the serous form of tenonitis occurs associated with or subsequent to rheumatism, gout, diphtheria, typhoid fever and influenza; the purulent form thru metastatic involvement, or from direct extension from opening the capsule in tenotomies.

This case was of acute onset subsequent to tonsillitis, with pain on motion, extreme chemosis of the conjunctiva, associated with marked exophthalmos and immobility. The temperature, pulse, blood count, X-rays of the sinuses and basal metabolic determinations were normal. There was definite evidence of focal infection in the tonsils and teeth, otherwise general examinations were negative.

Pincus reports a case in which he emphasizes fever, pain, malaise, and edema of the lids. He does not consider the question of an acute sinusitis. Pincus quotes Birsch-Hirschfeld from Graefe-Saemisch in which are collected forty cases of serous tenonitis. Some of these cases are of doubtful nature because they were incompletely worked up and some were complicated optic nerve lesions.

The diagnosis in this case was based on the history of acute onset, pain on motion of the eye, the extreme chemosis of the conjunctiva, and marked exophthalmos and on the absence of any general reaction.

233 Charles St.

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TUMOR OF THE PITUITARY BODY WITH UNUSUAL CHANGES IN THE FIELDS.

WM. EVANS BRUNER, M. D.

CLEVELAND, OHIO.

In the case here reported careful examination at first showed no evidence of tumor, and various forms of chronic poisoning were suspected. Homonymous scotomas appeared and increased. Later there was vomiting, weakness of the legs and somnolence. The optic nerves grew pale and there was continuous headache. Operation showed a suprasellar cyst. Removal of a large part of it was followed by very marked improvement.

We are accustomed to associate defects in the temporal portion of the field of one or both eyes with disease affecting the pituitary body and pressing upon the chiasm, altho Dr. Cushing in his book upon the "Pituitary Body and its Disorders," page 244, states that "Homonymous defects or tendencies in this direction are at least half as frequent as bitemporal ones. Indeed, they are possibly quite as frequent; for in a number of the patients who have been referred to us, the diagnosis has been based solely on the existence of a bitemporal hemianopsia, and doubtless there are many in whom an homonymous defect, even tho coupled with pallor of the discs, would not have been regarded as equally significant."

Doctor de Schweinitz in his Bowman Lecture, (Trans. Ophthal. Soc. of United Kingdom, volume 43, 1923) says:

"Altho it ought to be well known that homonymous lateral hemianopsia is far from 'very rare' in pituitary body disorders, or in neoplasms which have their origin in the hypophysis, one cannot escape the conviction that too often the absence of bitemporal hemianopsia diverts attention from the pituitary region, and that it is frequently too literally considered the 'signature of hypophysis tumour,' as it has sometimes been denominated. This homonymous field defect occurred in fully 6 per cent of the cases constituting my material."

The following case showed an homonymous hemianopsia in the early stage which defect disappeared to be followed later by a bitemporal defect.

CASE.

Mr. F. V., aged 42, consulted us Feb. 25th, 1922, with the history that for two months he had not been seeing so well at a distance and had also been having trouble in his close work. There had been no previous eye trouble and he had never worn glasses. There were no headaches. His general health has been below par for several months .but later he acknowledged that he had not been feeling well for a year or more. Examination showed vision R. 5/15, L. 5/30. Accommodation 0.50, pp. 15 cm. in each. Muscle balance, orthorphoria.

Under a mydriatic refraction was as follows: R.—0.50 V=6/9. L.—0.50 V=6/12. Ophthalmoscopic examination showed the nerves hyperemic with edges hazy, slight scleral ring in and choroidal ring with crescent beyond to the outer side of each nerve. Fundi high colored and granular. The fields showed the outer limits for form normal in each eye. But in the right eye there was a large paracentral color scotoma, for red and blue, to the outer side of fixation; while in the left there was likewise a paracentral scotoma, out and down, but not so definite or well defined. There was no absolute scotoma in either eye and no enlargement of the normal blind spot.

He gave a history of smoking rather excessively, six or eight cigars daily, and drinking an excessive amount of coffee. He denied the use of alcohol but later I learned he had for a time been drinking regularly some whisky which had been given him by friends, and this fact at first suggested the possibility of poisoning by impure alcohol. He owns a garage for electrical automobiles and the fumes from the batteries in the charging room were also considered; but this is all done in a separate room which is well ventilated and he has done very little work with the batteries for more than a year. While he goes all about the shop, most of his time is spent in the office.

He was sent to the Cleveland clinic for a thoro general examination, with

the additional suggestion that an X-ray be taken of the sella for the detection of possible disturbance in this location. Their examinations were negative and they concluded their report as follows:

"In summing up the case, we find the patient's general condition to be good with the exception of the anemia. It is quite apparent that he has a secondary type of anemia, without any adequate physical explanation for this condition. However, the history of working in fumes of acid, or lead, are sufficient to account for the lowering of the red blood cells. We expected at first to find some evidence of lead poisoning, but we were not able to confirm this suspicion either by the history or physical findings. However, it seems very essential that the patient change his type of work, so that further exposure to these fumes can be eliminated. In the second place, there seems to be a condition of chronic nicotin poisoning, as indicated by the excessive use of tobacco. But outside of the history, we had no evidence of this condition."

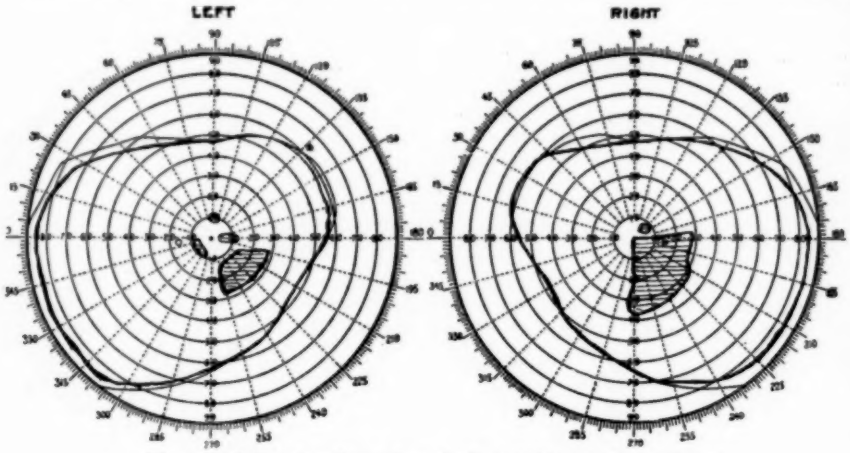

Fig. 1. Fields of patient taken April 4, 1922, showing scotomas.

He was given for a time a prescription of iron, quinin and strychnin.

April 4th, 1922, patient reported that he was feeling better and had gained in weight. Vision with glasses showed no change; in the right eye 6/9, but decided decrease to 6/30 in the left.

The fields showed a decided change as he now has a scotoma down and to the right in each eye, as per Fig. 1. Ophthalmoscopic examination showed

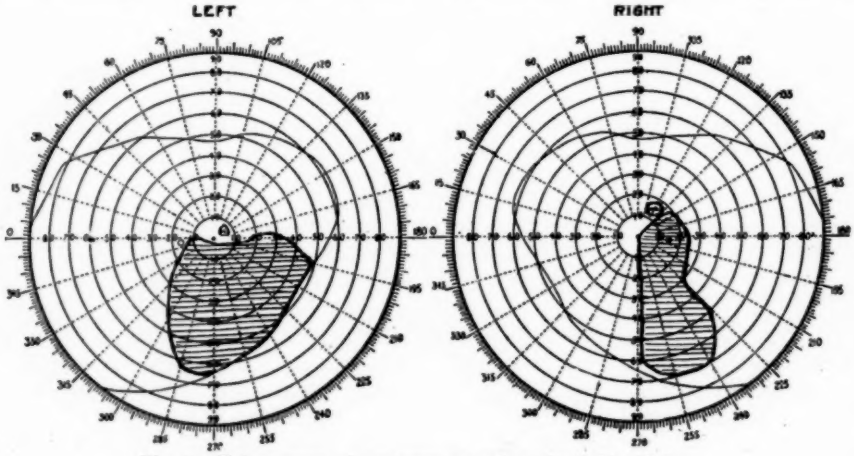

Fig. 2. Enlargement of scotomas as taken April 21, 1922.

no change in R. but in L. the nerve is possibly a trifle paler in the deeper layers, than in the right. Evidently now, if not before, a retrobulbar lesion of toxic character could be definitely excluded. The lesion would apparently be intracranial, posterior to the L. 6/60. The fields showed still further increase in size of the blind areas, indicating that the disease was progressing rapidly. Fig. 3. The fundi showed no change and there was not the slightest appearance of any edema, or neuritis, of either optic nerve.

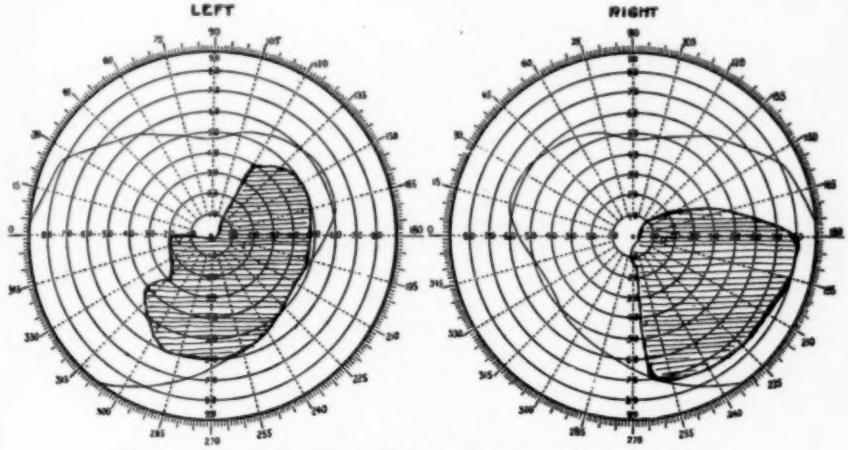

Fig. 3. Further increase of blind areas as taken May 11, 1922.

chiasm. He was again sent to the clinic for further examination, but nothing new was discovered.

April 21st he was not seeing so well; vision with glasses for R. 6/12, L. 6/30 partly. The homonymous scotoma had become larger, both discs were possibly a trifle gray in the deeper layers. See Fig. 2. He has been receiving mild antiluetic treatment. Examination of spinal fluid was suggested.

May 11. Complains of not seeing so well. Vision with glasses R. 6/15,

He did not report at the office again until Nov. 14th, six months later. He was then vomiting frequently, especially after breakfast, tho he had a good appetite. He complained a great deal of feeling weak in the legs and had not been working since his last visit on account of this weakness and his poor sight, tho he went to the shop regularly.

His wife reported that he is sleeping much of the time and will often fall asleep at the table. Tho he

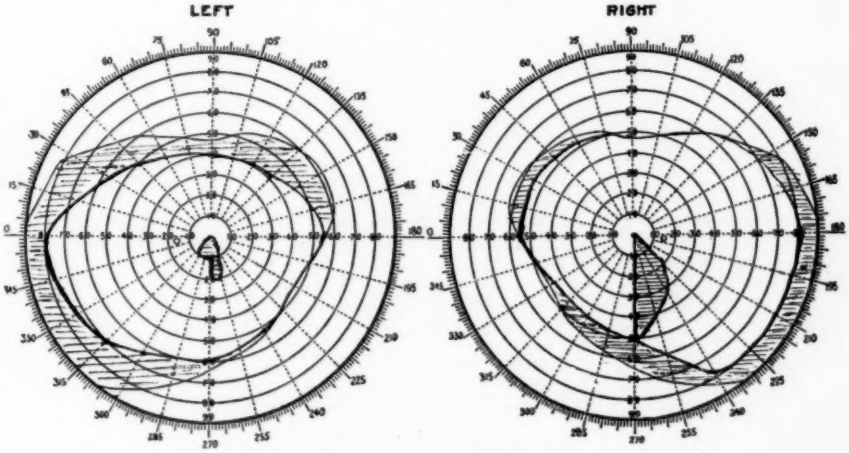

Fig. 4. Fields taken Nov. 14, 1922, hemianopsia having disappeared.

complains more of his vision, there was no change in the left eye, while with the right he actually saw better than at the last visit. R. 6/9, L, 6/60. The fields had decidedly changed, the hemianopsia having disappeared. See Fig. 4. Ophthalmoscopic examination was confirmed by the test which showed vision R. 6/6, L. 6/15. His fields (Fig. 5.) now showed a scotoma down and out in each eye, positive in the left, partly relative and partly absolute in the right.

March 22nd. The general condition

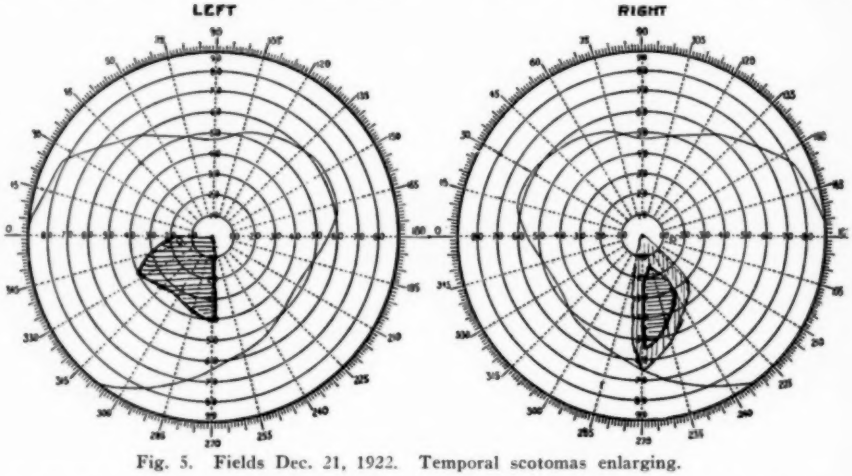

Fig. 5. Fields Dec. 21, 1922. Temporal scotomas enlarging.

showed slight pallor of the right nerve in the deeper layers, especially in the temporal half and more marked pallor of the left. Another neurologic examination at this time was negative. X-ray of the skull showed nothing to indicate pituitary tumor. Sugar tolerance was diminished. Spinal fluid indicated increased pressure and increased globulin, Wassermann negative. He was given potassium iodid.

December 21st, patient feeling better and the eyes seem better. This seems good, tho he is having continuous headache and is drowsy much of the time. Vision of right eye not so good, 6/9, left, unchanged, 6/60. Fields, however, now show very definite large and absolute scotoma down and out in each eye, a partial bitemporal hemianopsia. See Fig. 6. Another X-ray of sella showed no change since the previous ones. He was advised to see Dr. Cushing and was urged to go as soon as possible. In the meantime, until he could ar-

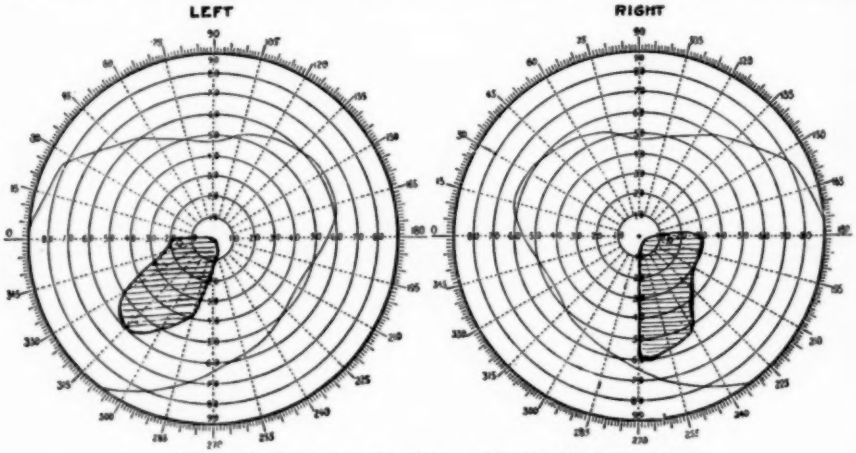

Fig. 6. Fields March 22, 1923. Enlarged absolute scotomas.

range to go, pituitary and thyroid extract were suggested. Unfortunately he did not go to Boston until almost four months later, and I did not see him in the interval. Dr. Cushing operated June 16th. He reports as follows:

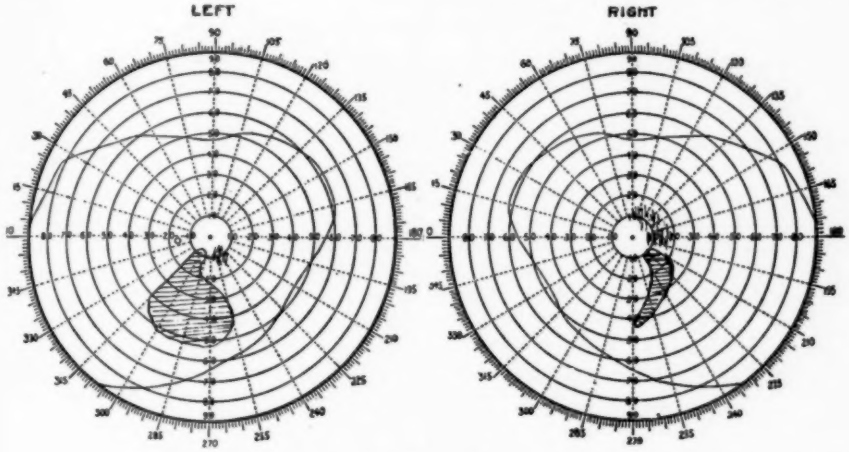

Fig. 7. Fields Jan. 19, 1924. Scotomas again altered. R. Smaller.

Concerning the patient: "He had a suprasellar cyst of the craniopharyngeal pouch variety. I was fortunate enough to be able to get in and remove a large part of the cyst, and for a time he did exceedingly well, in fact, his whole clinical picture was entirely changed. I felt very much encouraged about him, but he began having some vomiting, and I had to keep him here for a long time in an effort to get his stomach straightened out, in fact, did not succeed in doing so. One of his chief troubles is diabetes insipidus. There has been considerable improvement in his visual fields, but the chief gain has been in his mental condition, for he has come out of his former stuporous state in a most amazing fashion."

I did not see him again until January, 1924, seven months later. He states that he was almost blind before the operation so that he could no longer recognize a person across the room. Improvement in his vision began to be noticed only about two months ago and has been steadily increasing. The headaches, which had been almost constant and very severe, almost disappeared and he is feeling much better, altho he is still very weak and looks badly.

Vision with glasses: R. 6/21, L. 6/60. The fields are shown in Fig. 7. Ophthalmoscopic examination shows both nerves pale and gray, especially in the temporal half with slight scleral ring.

June 23rd, 1924. Patient feeling much better and stronger. Vision with glasses R. 6/21, L. 6/21—1. R. form field normal, no scotoma. L. outer limits of form field normal, very small scotoma down and out from fixation. The optic nerves show no change.

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OCULAR MANIFESTATIONS OF DIABETES.

WALTER R. PARKER, B. S., M. D.

DETROIT, MICH.

These are reviewed under the heads; amblyopia, paralysis of extrinsic muscles, changes in refraction, xanthelasma, iritis, cataract, retinitis, neuritis and retinal lipemia. A case of glaucoma is reported, illustrating the need of blood examination for sugar. Lecture before the Section of Instruction, American Academy of Ophthalmology and Oto-Laryngology, Montreal meeting, 1924.

A description of the functional disturbance of the eye, that may occur in cases of diabetes, will be followed by a recital of the changes met with in the refractive power of the eye, together with a brief outline of the ocular diseases that may be encountered as complications of this disease.

The only functional disturbance that will be considered in this connection is an amblyopia, that may develop in the course of an attack of diabetes.

Glycosuric amblyopia. An amblyopia may occur in diabetes, in which a central color scotoma is the characteristic field change. The peripheral field may be intact or restricted, and occasionally hemianopsia may be present (de Schweinitz). The amblyopia may be the only ocular symptom of the disease. De Schweinitz suggests the possibility of glycosuric amblyopia being more apt to be found in diabetics who use tobacco freely, than in those who are abstainers in this respect. This is a practical suggestion and one to be observed in the management of these cases.

Both the intrinsic and extrinsic ocular muscles are subject to impaired action as a result of diabetes. While paralysis of accommodation is most often seen in patients affected with syphilis or diphtheria, it occurs occasionally in diabetes, and possibly next to cataracts, is the most frequent ocular manifestation of this disease. In diabetes the paralysis is probably toxic in origin. It is usually bilateral—the pupil may or may not be involved. All have had cases of paralysis of accommodation in which the diagnosis was obscure.

Extrinsic Muscles. Rarely diabetes may be the cause of paralysis of the extrinsic muscles. Leber suggested that cases of paralysis of the extrinsic muscles fall into one of two groups—first, those in which the paralysis is the result of diabetes, directly or indirectly; secondly, those in which the ocular paralysis is due to a cerebral lesion which also gives rise to the diabetes. Paralysis of any of the ocular muscles may occur. Most frequently there is an involvement of the sixth nerve, or of single branches of the third nerve. The levator alone may be affected, producing a unilateral ptosis.

These paralytic complications are seen in slight, as well as in severe cases of diabetes. Many of the cases recorded by ophthalmologists have been in patients in whom the general symptoms were not severe, and who sought relief only from the discomfort caused by the ocular disturbances.

Changes in refraction. The change in the power of refraction of the eye met with in diabetes may manifest itself, either as an increase in the hyperopia, or in the myopia, myopic changes being the more common.

Cases of acquired *hyperopia* have been reported occasionally as due to diabetes. The original report of such a case was made by Horner[1]. A female, aged 55 years, suffering from severe diabetes, showed a sudden increase in the amount of hyperopia present. There was no visible change in the lens. Under treatment the degree of hyperopia became less by about two diopters, while the presbyopia remained unaltered in degree. The reason for the development of hyperopia was thought to be due to a shortening of the eyeball by reason of the loss of the fluids from its tissue.

Myopia due to increase in the density of the lens (index myopia) may occur in diabetes, as well as in the beginning stage of senile cataract. When a patient, who has required the use of reading glasses, states that he suddenly discovered he could read without them, he probably has a swollen lens,

although no discernible cataractous change be present. The possibility of a change in the lens being dependent on the presence of diabetes, should not be forgotten.

The classified diseases of the eye and the adnexa, that will be considered in this discussion as possible manifestations of diabetes, may be enumerated as follows: xanthelasma, iritis, cataracts, retinitis and lipemia retinalis.

Xanthelasma. The text books on ophthalmology devote little or no attention to the etiology of xanthelasma. Ewing[2] states: "It was shown by Chombard that xanthelasma may develop in the course of icterus, or with other diseases of the liver and with diabetes." and Johnson[3] claims that not a few cases of early xanthelasma develop diabetes. Without going into the subject in detail, I wish to call your attention to the possibility of the diabetic origin of xanthelasma; and suggest the advisability of subjecting all these cases to a general examination, including an estimation of the amount of blood sugar.

Iritis, sometimes associated with hemorrhage and fibrous deposits in the pupillary space, may develop in diabetic cases. Postoperative iritis is seen frequently in diabetics. It is often low grade in character, but may be disastrous in its effect on vision. After extraction of a diabetic cataract for instance, the immediate results may be satisfactory, but the trauma incident to the operation may excite a reaction, chronic in character, that may completely destroy the functioning power of the eye, weeks or even months after the time of the operation.

Cataracts. In the list of general diseases, diabetes is the one most frequently complicated by cataract. Diabetic cataracts are always bilateral, and usually develop when the amount of sugar in the urine is high. According to Klein, posterior polar, combined with posterior cortical cataracts, unassociated with choroiditis are significant of diabetes. To the exceptional cases might be added retinitis pigmentosa.

The most characteristic diabetic cataract, however, is a rapidly forming cataract in a young person who is the subject of a well advanced diabetes. The lenticular change may develop in very young patients. Gradle recently reported a case occurring in a girl aged 11. The lens was needled, and the result was most satisfactory. Not every cataract seen in the diabetic is a diabetic cataract. A patient with a senile cataract is not immune from diabetes, nor is a diabetic free from the senile changes as seen in the lens.

The immediate result following the extraction of diabetic cataract, so far as the operation is concerned, is thought to be less favorable than in cases of uncomplicated senile cataract. This may have been true when little or no attention was paid to the presence of sugar in the urine, and no study of the blood content was made. If patients are made as nearly sugar free as possible before operation, I have noted no difference in the conduct of the healing process of the corneal wound in the diabetic cataract, from that seen in cases of uncomplicated senile cataract.

One does, however, meet a larger percentage of cases with postoperative iritis, than would be observed in an equal number of cases after removal of uncomplicated senile cataracts. An old uveitis may be lighted up, that leads to a slow convalescence and an unsatisfactory visual result. To minimize the risk it is essential that all diabetic patients be made as nearly sugar free as possible, before subjecting them to an operation for extraction of the lens. I have no comparative results obtained by the extraction of the lens in diabetics by the various methods of procedure.

It was formerly believed that the cause of diabetic cataracts was to be looked for as the result of abstraction of water from the lens. That is, the aqueous containing sugar would withdraw water from the lens so that the latter would become opaque. This view appeared to be confirmed, by the fact that the diabetic cataracts occur only when the amount of sugar present is greatly in excess. It is true that healthy lenses in the capsule when placed in a solution of sugar become

clouded, and if the opaque lens is then put in a solution of water, it again becomes clear.

The amount of sugar in the aqueous of a diabetic is so very small, however, that it is doubtful if the action of the sugar in absorbing the water from the lens is the sole cause of the cataract. It is probably due to a more complicated disturbance in the nutrition of the lens, the nature of which is still unknown. It is to be hoped that the wonderful discovery, made by Dr. Banting and his associates, will eventually throw light on this most obscure subject. Cases have been reported in which the observed opacities in the lens have diminished after successful treatment of the diabetes. I have never observed this favorable outcome.

Reports concerning the effect of insulin on the lens are somewhat conflicting; and more records, carefully prepared, are needed to settle the question. In one instance, a clearing of the lens was reported, based on the fact that the patient no longer required the use of glasses for reading purposes. As a matter of fact, a swollen lens incident to beginning cataract, might have been present in this case.

Retinitis. The involvement of the retina in diabetes is much less frequent than that of the lens (2 to 5%). It occurs late in the disease, and usually in patients over fifty years of age. The retinal lesions may be anything, from localized edema with a few white spots scattered about the macula, to changes resembling those seen in extreme cases of albuminuric retinitis. In diabetic retinitis, the degenerative spots about the macula are large; the hemorrhages, if present, may be small and well circumscribed, punctate in character or disposed in groups, sometimes coalescing to form large patches.

In its typical form, diabetic retinitis may be suspected. But a picture very similar may be seen in cases from other causes; such as brain tumor, nephritis and occasionally arteriosclerosis, or it may closely resemble a retinitis circinata. A differential diagnosis is often very difficult, and frequently cannot be made from the appearance of the retina alone.

The name "central punctate diabetic retinitis" has been applied to a collection of small white spots and punctate hemorrhages irregularly arranged between the disc and macula.

Hemorrhages into the vitreous are said to be more common in diabetics than in cases of nephritis, while the nerve is more frequently involved in an inflammatory process in nephritis.

Neuritis. The optic nerve reacts in a most sensitive manner to the effects of disturbance of nutrition. Among the chronic diseases that give rise to nutritive inflammatory changes, is diabetes. These changes in diabetics cannot be differentiated from those seen in the nerve in acute exanthemata, uremia and disturbances of menstruation, etc. The prognosis in diabetic neuritis is good, if proper treatment is instituted, even when the visual acuity may be seriously affected. (Fuchs.)

Lipemia retinalis. The name lipemia retinalis has been given (Heyl) to an ophthalmoscopic picture, characterized by a light colored fundus in which the arteries and veins appear enlarged and flattened. The relative size of the vessels is so altered that they appear to have about the same calibre. No hemorrhages or exudations develop and the vision is not impaired.

While there is present an increase in the fat content in the blood in all cases of diabetes, lipemia retinalis is a rare condition. It is most often seen in diabetic patients under 30 years of age, who have a blood fat content from 4 to 5%. Whether the appearance of the fundus is due to the fat in the blood, to a change in the lymph in the perivascular spaces, or to fat deposits in the adventitia, is not known. The prognosis is always grave. Nearly all the cases that have been followed, have terminated fatally in about five months after the appearance of the fundus change.

In conclusion, I wish to urge the necessity of more careful examinations and detailed reports of cases in this group. It is important that in addition to a report on the urine analysis, the results of a blood analysis should be given. As I suggest earlier in the paper, there is a good field for study in observing

the conduct of the lens changes after the administration of insulin. I would also particularly urge a careful examination for the possibility of the presence of diabetes in every case of operation on the globe in which the convalescence is not running a satisfactory course. I wish to review one case record that will serve to illustrate the points presented.

A female, aged 54, suffered an attack of glaucoma in both eyes, the right being affected several months before the left. In spite of the use of miotics and general treatment, the process, tho variable in its course, was not arrested. An iridectomy was performed, first on the right and later on the left eye. Again the increased tension was relieved only temporarily, and a sclerocorneal trephine operation was performed on each eye. The tension remained within normal limits for about six weeks, when in spite of massage, miotics and general treatment, it gradually increased. At this stage of the disease another complete examination including the blood chemistry, revealed the presence of excess blood sugar, it being 250. Insulin was administered and the diet regulated. The tension gradually returned to normal in both eyes and has remained so for nearly one year. During the course of treatment four examinations of the urine were made, and all were reported as negative. Since the administration of insulin the blood sugar has remained within the normal limits.

Apparently the presence of diabetes in this case was a contributing factor in keeping up the tension in the eyes. The case is reported to illustrate the possible clinical course of a case of glaucoma in the presence of diabetes and to emphasize the importance of a thoro general examination in all cases in which the convalescence is not progressing in a satisfactory manner.

1025 David Whitney Bldg.

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DEMONSTRATION OF NORMAL AND ABNORMAL PUPILLARY REFLEXES.

FRANCIS HEED ADLER, M. D.

PHILADELPHIA, PA.

The method of teaching students here described brings out sharply the significance of certain alterations of the pupillary reflexes important in diagnosis. They are here considered with reference to the afferent pathway, the efferent pathway and sympathetic innervation of the iris. The method has been developed for the Department of Physiology in the University of Pennsylvania. Read before the Section on Ophthalmology of the College of Physicians of Philadelphia, November 20, 1924.

In teaching students the pathways over which the nerve impulses for pupillary reflexes travel, it seemed advisable to afford them some opportunity of actually seeing the effects of lesions in different parts of the pathway, on the basis that what one sees is more easily remembered than what one simply hears.

Since it is not always possible to obtain clinical material when most needed, the desired lesions were experimentally produced in animals. There are three possible sites for a lesion to occur in the nerve pathways controlling the movements of the pupil:

1. THE AFFERENT PATHWAY. Starting with the cones, and possibly the rods in the macular region, fibers proceed to the anterior corpus quadrigeminum. These fibers probably only partially decussate in the chiasm, since section of the chiasm in the midline in monkeys does not abolish the consensual light reflex, as Hartridge[1] has demonstrted. New fibers proceed from the anterior corpus quadrigemi-

num to the 3rd nerve nucleus of each side.

In order to produce this lesion the optic nerve was cut in the orbit in a series of cats. The technic is as follows:

Under strict aseptic precautions the orbit is entered thru an incision running from in front of the ear down along the upper border of the malar bone. After a portion of the malar bone and the external angular process has been chipped away the orbital fascia can be incised, and direct access to the orbital contents obtained by separating the external rectus from the inferior rectus. No muscles need be cut. The optic nerve is easily found by rotating the eye in toward the nose. About 5 mm. back of the optic nerve entrance into the globe the two long ciliary nerves will be found closely applied to the surface of the optic nerve. These must be gently pushed to one side, and with a pair of fine scissors the entire optic nerve can be cut thru with one snip, without damaging any of the contiguous structures. There is generally profuse bleeding as the nerve is cut, but this is easily controlled by packing for a moment or two. After all bleeding has stopped the fascia and skin are sutured. In this, as in the succeeding operation, it is necessary to use a head mirror for illuminating the operative field.

After allowing several weeks to elapse for complete recovery the animals showed the following picture:

The right pupil (operated side) was partially dilated in dim light and would not react directly to light but reacted consensually when light was thrown into the left eye. There were no external ocular muscle palsies. The left eye was normal in appearance and reacted directly to light but would not react consensually when light was thrown into the right eye.

From this data, which the student can obtain for himself, it is possible to localize the lesion as situated on the afferent pathway somewhere between the eye and the anterior corpus quadrigeminum.

TABLE I.

	Right eye	Left eye
Width of pupil in dim light.....	5 mm.	3 mm.
Direct light reflex..	—	+
Consensual light reflex	+	—
Muscle palsies....	—	—

Diagnosis = Lesion of afferent pathway right side, between eyeball and right anterior corpus quadrigeminum.

2. THE EFFERENT PATHWAY. From the 3d nerve nucleus (pupillomotor nucleus) the fibers proceed to the orbit, and enter the ciliary ganglion. New fibers then proceed by way of the short ciliary nerves to the eyeball, and via the suprachoroidal space finally reach the sphincter muscle.

A temporary lesion of this pathway can most simply be produced by atropin, which paralyzes the 3d nerve endings, but for permanent destruction of the nerve endings it is necessary to extirpate the ciliary ganglion. The technic for this operation has been described by H. K. Anderson[2] to which reference can be made. Allowing one month after operation for complete degeneration of the nerve endings to take place, the cats presented the following picture:

The right pupil (operated side) was dilated ad maximum. No external ocular muscle palsies were present. No direct light reflex could be obtained in the right eye and no consensual reflex when light was thrown into the left eye. The left pupil was entirely normal and reacted to light directly, and consensually when light was thrown into the right eye.

From this data presented in the following table the student can localize the lesion as situated somewhere on the right 3d nerve, peripheral to the branches supplying the external ocular muscles.

TABLE II.

	Right eye	Left eye
Width of pupil in dim light.....	11 mm.	4 mm.
Direct light reflex..	—	+
Consensual light reflex	—	+
Muscle palsies....	—	—

Diagnosis = Lesion of efferent pathway on the right side, beyond the last branch to the external ocular muscles.

3. SYMPATHETIC INNERVATION. Destruction of the sympathetic innervation to the dilatator pupillae is easily accomplished by removal of the superior cervical ganglion in cats. After allowing two weeks for degeneration to take place, the cats presented the usual picture of sympathetic paralysis, i. e., the pupil on the operated side was smaller than on the intact side. The eyeball was slightly enophthalmic and the nictitating membrane was partially drawn across the eye. All the reflexes were present in both eyes. An accurate localization of the lesion can be made by the student by applying a 4% solution of cocain to both eyes, when the pupil on the operated side will not dilate, whereas the intact side will. Since cocain acts on sympathetic nerve endings, this experiment shows that the lesion was situated in or peripheral to the superior cervical ganglion. It is better to use rabbits for this lesion since cocain does not dilate the normal cat's pupil very satisfactorily. This experiment shows that the lesion is situated in the sympathetic nerve endings.

SUMMARY. By creating various lesions of the pupillary reflex arcs in experimental animals, the student is enabled to see for himself the result of such lesions and to localize them.

313 South 17th Street.

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FIBROSIS AND VASCULARIZATION OF BLOOD IN VITREOUS.

GILBERT E. SEAMAN, M. D. AND F. HERBERT HAESSLER, M. D.

MILWAUKEE.

This paper reports two cases in which vessels and connective tissue formations in the vitreous were presumably caused by preceding intraocular hemorrhage. Interesting facts noted in connection with such cases as published in the literature are discussed.

Hemorrhage into the vitreous or retina is a relatively frequent occurrence, but in only an occasional instance does the mass of blood become organized. In almost all cases in which irregular masses of connective tissue, with or without loops of blood vessels, are seen, the formation of this tissue has been preceded by hemorrhage. Inflammatory exudate may also stimulate the proliferation of fibroblasts and blood vessels. A distinction in nomenclature is here made between cases in which the newly formed tissue lies directly on the retina or even in it, (retinitis proliferans), and those cases in which it projects into the vitreous. There is no essential difference between the two lesions except in the position of the fibrous tissue and vessels. The two following cases belong to the latter category, which might be called hyalitis proliferans by analogy to retinitis proliferans:

Case 1. S. M., male. Age 34. Complains that there is something in his left eye which casts a shadow, of which he is definitely aware when trying to fix an object which has been seen peripherally. Two years ago a diagnosis of retinal detachment in the right eye was made. At one time, several years ago, he was almost blind. While in France he was told he had syphilis and was given two treatments intravenously. At present Wassermann reaction of blood and spinal fluid is negative.

Present Condition: R. E. externally normal. A totally opaque lens makes examination of the posterior segment of the eye impossible. L. E.: The anterior segment is normal. In the vitreous a large irregular mass of fibrous tissue floats and is slightly movable with oscillation of the eye. It is distinctly anterior to the level of the retina, and approximately in a zone between the posterior and middle thirds

of the vitreous. The tissue is continuous with a very fine stalk of connective tissue, arising in the optic disc and passing directly anteriorly to meet the larger mass in the vitreous, which extends horizontally and temporally from this point for a distance of five or six disc diameters. Both the stalk and the mass in the vitreous are richly supplied with loops of blood vessels. In the stalk a vessel with a diameter of nearly one-half that of the largest retinal vein, is twisted spirally, suggesting the arrangement of the vein in the umbilical cord. In the retina, under the connective tissue in the vitreous, is a pigmented area almost as large as the disc, suggesting a healed chorioretinitis. The retinal vascular system is normal and no other lesions were seen. The patient can note distinctly when the ophthalmoscopic lamp is so placed, that the mass in the vitreous casts a shadow on the macula.

The probable cause of all his eye lesions is syphilis—syphilitic retinitis, followed by detachment due to subretinal exudate or contraction of scar tissue, to which the cataract is secondary, in the right eye, and chorioretinitis complicated by a hemorrhage which became organized, in the left eye.

Case 2. A. H., female. Age 42. Nine years ago had an attack of redness and severe pain in her right eye, lasting for nearly a week and gradually passing off. One year later she had a similar experience. When that acute attack had subsided she noted that she had no central vision. A careful general physical examination revealed no signs of disease. Wassermann reaction was negative; blood pressure normal. One year ago passed a life insurance examination.

Right eye: Externally normal; anterior media and lens clear. Extending from the central vascular cone of the disc into the vitreous is a filament of connective tissue having the thickness of one of the smaller retinal arteries. Near to the distal end the tissue bifurcates and somewhat more distally these two branches reunite. The optic disc is decidedly pale and bluish in color. There is a shallow cupping with sloping, temporal wall, and distinctly visible lamina cribrosa. The disc is on the same level with the

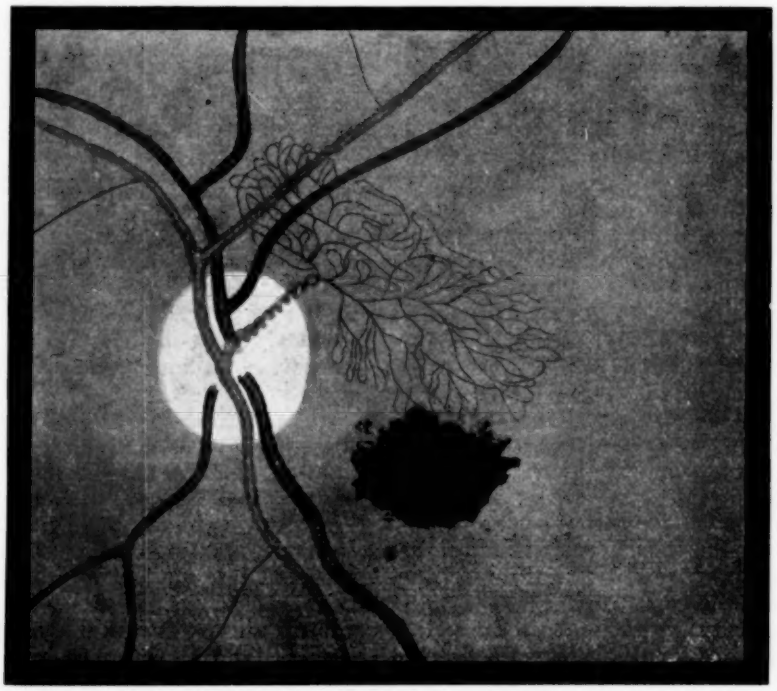

Fig. 1. Appearance of fundus in Case 1. L. E. Black pigment patch temporal side of disc; twisted vessel passing upward and forward to vascular network in vitreous.

fundus. The demarcation between optic nervehead and surrounding retina is normal. A thin line of pigment between 9 and 12 o'clock accentuates the margin in the upper temporal quadrant. The blood vessels are normal in origin, distribution, course, relative and absolute caliber, tapering and reflexes. Occupying the site of the macula is a roughly circular area, two disc diameters in diameter, in which there is complete destruction of the retinal pigment layer. The choroidal vessels are clearly seen. The interstices between these vessels are yellowish brown, therefore any atrophy of choroidal stroma pigment, which may be present, must be slight. None of the choroidal vessels are sclerotic or obliterated. There are irregular masses of pigment over the choroidal vessels. No visible retinal vessels traverse the area.

The disappearance of the retinal pigment layer, combined with a scotoma corresponding to the area, justify the conclusion that there is a central tapetoretinal atrophy. The patient in all probability had juvenile recurrent intraocular hemorrhage. In one of the attacks the hemorrhage was probably under the limitans interna and over the macula. The hemorrhage which involved the vitreous and stimulated the proliferation of the connective tissue, may have occurred in either attack.

Fibrosis and vascularization of the vitreous were observed early in the history of ophthalmoscopic examination. Coccius reported one case in 1859; Mauthner, 1868, and Edward Jaeger observed a case in 1869, of which he published a picture in his Atlas. Since 1880 reports have been more frequent and are chiefly in the American literature. The primary disturbance has always been a hemorrhage. This may be very massive, obscuring all view of the fundus for a long time, or so insignificant as to probably not be the entire cause of vascular proliferation. The vessels frequently grow into the vitreous to a considerable depth. They usually arise from the disc, but occasionally from a peripheral vessel. Sometimes two vessels, arising separately on the disc and twisted to form an umbilical cord like spiral, are observed. Vessels may end blindly or return as a loop. The mass in the vitreous may be anything from

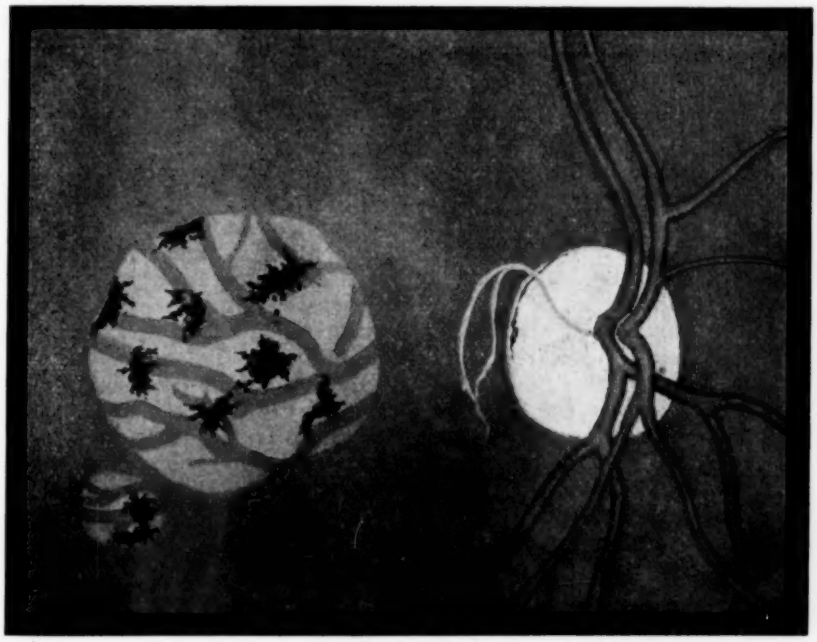

Fig. 2. Appearance of fundus in Case 2. R. E. Strand of tissue passing from retinal veins on the disc to temporal side. Patch of atrophy of retinal pigment and small choroidal vessels at macula, and below.

a single loop to a large mushroom like tissue, that sways with the movements of the eyeball, and has such a thin interstitial tissue, that it looks like an insect's wing. Sometimes a few flocculent white opacities are found in addition to the vessels, and occasionally there are dense white infiltrates or membranes, which partially obscure the vessels. In the fundus one usually finds a chorioretinitic scar, which is presumably the residue of the lesion from which the hemorrhage arose. Even tho the hemorrhagic disease is bilateral, the vitreous vascularization has always been limited to one eye, except in Harlan's case, where a small vessel developed in the other eye.

The diagnosis is usually not difficult, tho the appearance may be strikingly like that of a congenitally anomalous retinal vessel projecting into the vitreous. If the vitreous is still opaque from a massive hemorrhage, it may suggest an intraocular tumor. Eyes have been enucleated for this reason. (Marple, 1901.)

The hemorrhage preceding vascularization need not be large. Marple, 1906, and Hirschberg, 1889, observed cases from the beginning, and the hemorrhage was so slight that it could not have been the only, nor even the essential cause. If no recrudescence of hemorrhage occurs, the vessels may gradually disappear permanently.

Marple (1906) observed a hemorrhagic retinitis in a woman, aged 63 years, for one year, with vision of 20/40. Eventually a few small clots formed in the vitreous, two small nubbins of vessels appeared as proliferation on the disc, and from these an extensive vascular mass developed, the vitreous haze reducing the vision to 10/200. After two years the vessels became empty and eventually disappeared entirely, the vision returning to 20/30. Harlan (1889) saw a woman aged 50 years, who had vessels for two years and when she was again observed 14 years later, no trace of vessels could be found. It is possible that my Case 2 is merely a late stage of vitreous vascularization, in which the vessels have already become empty and atrophic, and that the vessels in Case 1 may also undergo involution in time. The interstitial tissue supporting the newly formed vitreous vessels, is connective tissue and not neuroglia, just as in retinitis proliferans.

The causes of the underlying hemorrhage have been determined to be syphilis, recurrent juvenile retinal hemorrhage, tuberculosis, chorioretinitis of congenital syphilis, diabetic retinitis with hemorrhage, arteriosclerosis and, in one case, hemophilia. What the ultimate stimulus to vascular proliferation is, is unknown. The one constant finding in all these cases is a preceding hemorrhage. It is likely that some constituent of the blood is responsible.

However, hemorrhage is common and vascularization very rare. In the cornea vascularization of experimental lesions is not observed before exudate has been present for several days. An obvious suggestion is that fibrin, in some relation to the vessel from which the new vessel bud is to proliferate, may be the stimulant. Tho it is easy to inject blood plasma intracorneally, and thus introduce a mass of fibrin which will remain unabsorbed for a week or more, we have never been able to observe corneal vascularization in any instance in which we could be sure that the clotted plasma was the only factor.

If contact of the clot with the vessels from which the new, vascular buds proliferate, is an essential factor, this would explain the overwhelming preponderance of instances in which the newly formed vessels spring from the optic disc. When the blood in the vitreous fills the central hyaloid canal, the patency of which can hardly be doubted in the adult vitreous, the posterior end of the clot is in contact with the disc.

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ELECTROTHERMOPHORE IN TREATMENT OF CORNEAL ULCERS.

CHARLES A. YOUNG, M. D

ROANOKE, VA.

This is a detailed study of twenty-five cases showing various types of corneal ulcers treated with the Shahan thermophore. This is prefaced by mention of earlier use of heat in the treatment of such ulcers, the main features of the cases are presented in tabular form and conclusions drawn from this study. Candidate's Thesis for Master of Medical Science degree, Graduate School of Medicine, University of Pennsylvania.

Heat has been used in the treatment of corneal ulcers in many forms, moist applications, dry heat including hot water bottle, Japanese "hot box," Leiter's coils and the electric heated pad.

Bourgeois (1899)[1] employed a blast of hot air by using the dental blast, the tip of which is heated over an alcohol lamp.

Weekers (1910)[2] used the actual cautery holding it at a little distance from the ulcer.

Martinache (1873)[3] presented two cases illustrating the curative value of the actual cautery in the treatment of corneal ulcers. Martinache was probably the first to use the actual cautery in the treatment of corneal ulcers.

Prince (1916)[4] heated a copper ball which he held close to, but not in contact with the ulcer.

Gros (1920)[5] has an ingenious instrument which consists of a silver or red copper tip, having two branches of different sizes which can be touched to the area to be treated. The tip extends into a glass container which is tightly fitted around it. The glass is filled with the following mixture:

Lead,	5 parts
Tin,	3 "
Bismuth,	5 "

The mixture has a fusing point of 70° C. (158° F.).

In using the instrument the tip is heated over an alcohol flame until the mixture contained in the glass begins to fuse at which time it is ready to use. If a lower temperature than 70° C. (158° F.) is desired the instrument is permitted to cool.

Shahan (1916)[6] first described his thermophore and its use. His latest instrument, which can be kept at any predetermined temperature for any length of time, consists of a central brass tube containing a resistance coil having a central tubular opening; in the upper part of this opening the bulb of the thermometer is placed and below one end of the applicator. On one side there is a regulating screw which controls the temperature. The applicators, eight in number are double ended giving sixteen tips of various sizes. This instrument can be used on any 110 volt current. The applicators are made of brass, plated with nickel.

Shahan (1917)[7] reported thirty-two cases of serpiginous ulcer of the cornea, hypopyon keratitis of pneumococcus origin, treated with the Shahan thermophore in which the results were very favorable. The visual results are not given in his paper.

Green (1917)[8] reported five cases of pneumococcus ulcer of the cornea, treated with the Shahan thermophore, obtaining prompt relief of pain and rapid healing of the ulcer. Visual results given in four cases: Case 2 —6/20, case 3 —6/40, case 4 —6/40, and case 5 —6/32.

Thomson, Edgar S. (1917) in his discussion of Weeks[9] paper, "Disciform Keratitis" makes the following statements: "I treated a young man, otherwise in good health, for six weeks without the slightest benefit, when it occurred to me to destroy the infective material as Dr. Bennet described. I applied the Shahan thermophore in this case, heated to 160° F., directly over the disciform spot, for one minute. He made a very rapid recovery. The eye began to whiten at once, the hypopyon absorbed, and he was out of the hospital in a week, the whole case having lasted a little over two months."

"Another case was seen in consultation, and I did not have a chance to apply this treatment; but have had

very good success with the thermophore in other cases of similar character."

DETAILS OF CASES STUDIED

	Cases	Per cent
ETIOLOGY		
Following—		
Foreign body injury	9	36
Coryza and herpes of lips	2	8
Acute conjunctivitis	1	4
Chronic conjunctivitis	2	8
Cause unknown. Including three cases with infected lacrymal sac	11	44
Sex—		
Females	9	36
Males	16	64
Age—		
12 to 20 years	3	12
21 to 30 years	2	8
31 to 40 years	3	12
41 to 50 years	11	44
51 to 60 years	4	16
61 to 72 years	2	8
Race—		
Negro	3	12
White	22	88
Occupation—		
Males:		
Laborers	8	50
Laborers, skilled	6	38
Carpenters	2	12
Females:		
Housework	6	67
Student	1	11
Seamstress	1	11
Laundress	1	11

DETAIL OF ULCERS

	Cases	Per cent
Type of Lesion—		
Dendritic ulcer	1	4
Abscess of cornea	1	4
Marginal keratitis after conjunctivitis	2	8
Infected ulcer without hypopyon.	8	32
Infected ulcer with hypopyon	13	52
Attack—		
First attack	20	80
Second attack	3	12
Third attack	2	8
Duration on Admittance—		
2 to 7 days	9	36
8 to 21 days	10	40
22 to 41 days	2	8
6 weeks to 5 months	4	16
Size of Ulcer on Admittance—		
3 to 4 mm. in dia	6	24
6 to 7 mm. in dia	2	8
3x2 mm. to 5x4 mm. in dia	10	40
6x½ mm. to 6½ to 4 mm. in dia.	6	24
7x2½ mm. in dia	1	4
Location of Ulcer—		
Central	18	72
Paracentral	2	8
Peripheral	5	10
Undermining—		
Undermined	12	48
Not undermined	13	52
Vascularity—		
Vascular	9	36
Nonvascular	16	64
Depth—		
Superficial	3	12
Deep	22	88
Condition of Sac—		
Infected	4	16
Uninfected	21	84
Course—		
Acute	18	72
Subacute	3	12
Chronic	4	16
Deep Infiltration—		
Present	22	88
Absent	3	12
Hypopyon—		
Present	13	52
Absent	12	48

BACTERIOLOGY.

I am indebted to Dr. John Kolmer for the bacteriologic studies made of the cultures and smears as herein reported.

All of the cultures were made on blood agar slants, and were incubated for a period of 72 hours before examination.

	Cases	Per Cent
Staphylococcus aureus alone	4	16
Staphylococcus aureus with Pneumococcus type iv.	1	4
Pneumococcus type iv alone	3	12
Pneumococcus not typed alone	1	4
Pneumococcus not typed with Staphylococcus Albus	1	4
Diphtheroids	4	16
Staph. Albus with B. Xerosis	2	8
Pneumococcus (not typed) with Diphtheroids	1	4
Negative	8	32

It was found quite difficult to obtain growth of organisms on the culture media from known infected ulcers. In the eight cases in which no growth was obtained only two were of the non-infected type.

Weekers (1913)[10] gives the thermal death points of the pneumococcus and Morax-Axenfeld bacillus as follows:

Pneumococcus, 24 hrs., 42° C. (108° F.)

Pneumococcus, 10 min., 56° C. (138° F.)

Pneumococcus, instantly, 65°—70° C. (149°—158° F.)

Morax-Axenfeld, in 5 min., 56° C. (131° F.)

Besson[11] likewise gives thermal death point of the pneumococcus in culture as 65° to 70° C. (149°—158° F.)

c.c. of saline solution. Of this suspension 1 c.c. was placed in each of a series of 10 test tubes each containing 4 c.c. of saline solution. This gave an even suspension of 5 c.c. in each tube.

The second tube of each series was immersed in water bath at 40 degrees

PART I.

	Staph. Albus I.										Staph. Albus II.									
	Unheated.	40° C.—104° F.	50° C.—122° F.	60° C.—140° F.	70° C.—158° F.	75° C.—167° F.	80° C.—176° F.	85° C.—185° F.	90° C.—194° F.	100° C.—212° F.	Unheated.	40° C.—104° F.	50° C.—122° F.	60° C.—140° F.	70° C.—158° F.	75° C.—167° F.	80° C.—176° F.	85° C.—185° F.	90° C.—194° F.	100° C.—212° F.
1 day	+	+	+	−	−	−	−	−	−	−	+	+	−	−	−	−	−	−	−	−
2 days	+	+	+	+	−	−	−	−	−	−	+	+	+	+	−	−	−	−	−	−
3 days																				
4 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−
5 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−
6 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−
7 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−

PART II.

	Staph. Aureus I.										Staph. Aureus II.*									
	Unheated.	40° C.—104° F.	50° C.—122° F.	60° C.—140° F.	70° C.—158° F.	75° C.—167° F.	80° C.—176° F.	85° C.—185° F.	90° C.—194° F.	100° C.—212° F.	Unheated.	40° C.—104° F.	50° C.—122° F.	60° C.—140° F.	70° C.—158° F.	75° C.—167° F.	80° C.—176° F.	85° C.—185° F.	90° C.—194° F.	100° C.—212° F.
1 day	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	+	+	−	−	−
2 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	+	+	−	−	−
3 days																				
4 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	+	+	−	−	−
5 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	+	+	−	−	−
6 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	+	+	−	−	−
7 days	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	+	+	−	−	−

* Staph. Aureus II Not Obtainable from Eye.

Following report of thermal death points as carried out under the direction of Dr. John Kolmer by Miss Elizabeth M. Yagle at the University of Pennsylvania, Graduate School of Medicine, Laboratory of Pathology and Bacteriology.

The organisms were all isolated from eye cultures except staphylococci aureus II. This was an old laboratory stock culture, which may account for its being more resistant. The tests were conducted as follows:

Three loopfuls of a pure culture of each organism were suspended in 10 c.c. allowed to remain until the temperature of the contents of the tube had reached 40 degrees C. and then exposed to that temperature for 1 minute. The temperature was obtained by means of a thermometer suspended in a control tube of saline solution.

The third tube was exposed to 50 degrees C. the fourth tube to 60 degrees C. and so on.

After all tubes were heated, each was cultured on a tube of agar for the staphylococci and Loeffler's blood serum for xerosis, and the cultures examined each day for seven days. The results are tabulated above. The first tube is a control of the unheated organism.

PART III.

	B. Xerosis I.										B. Xerosis II.										B. Xerosis III.									
	Unheated.	40° C.—104° F.	50° C.—122° F.	60° C.—140° F.	70° C.—158° F.	75° C.—167° F.	80° C.—176° F.	85° C.—185° F.	90° C.—194° F.	100° C.—212° F.	Unheated.	40° C.—104° F.	50° C.—122° F.	60° C.—140° F.	70° C.—158° F.	75° C.—167° F.	80° C.—176° F.	85° C.—185° F.	90° C.—194° F.	100° C.—212° F.	Unheated.	40° C.—104° F.	50° C.—122° F.	60° C.—140° F.	70° C.—158° F.	75° C.—167° F.	80° C.—176° F.	85° C.—185° F.	90° C.—194° F.	100° C.—212° F.
1 day .	+	+	+	−	−	−	−	−	−	−	+	+	+	−	−	−	−	−	−	−	+	+	+	−	+	−	−	−	−	−
2 days.	+	+	+	−	−	−	−	−	−	−	+	+	+	−	−	−	−	−	−	−	+	+	+	−	+	−	−	−	−	−
3 days.																														
4 days.	+	+	+	−	+	−	−	−	−	−	+	+	+	+	−	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−
5 days.	+	+	+	−	+	−	−	−	−	−	+	+	+	+	−	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−
6 days.	+	+	+	−	+	−	−	−	−	−	+	+	+	+	−	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−
7 days.	+	+	+	−	+	−	−	−	−	−	+	+	+	+	−	−	−	−	−	−	+	+	+	+	+	−	−	−	−	−

As it required from one and one-half to two minutes for the contents of the tube to reach the desired temperature in addition to the exposure of one minute this is a probable source of error in that the thermal death point given is slightly below the actual death point with the use of the thermophore in practice.

Cheney (1922)[12] studied 12 cases of pneumococcus ulcers, 66% caused by type IV organisms and 33% by type III organisms. It is to be noted that in these cases no type I or type II organisms were encountered.

In this series of 25 cases studied and treated with the thermophore, pneumococcus organisms were found to be present in 7 cases either alone or associated with other organisms. Of the 4 cases typed all belonged to type IV.

SYSTEMIC AND CORRELATING EXAMINATIONS.

Wassermann reactions negative except in two cases, in one of which it was weakly positive to cholesterinized antigen only and in the other it was +++. It is interesting to note that in the +++ case the inflammatory reaction persisted (after ulcer had healed) until antiluetic remedies were used.

Von Pirquet reaction was positive in two cases only, and had no bearing on condition of cornea.

While examination of urine, teeth and tonsils showed in many instances disease, their condition had no apparent influence on the corneal lesion.

X-ray of sinuses by Dr. Pfahler showed only four cases without apparent sinus disease. In the twenty-one cases with positive X-ray findings no connection could be established between the sinus affection and the course of the corneal affection.

General condition of patient, which in most instances was good, had no bearing upon the corneal disease.

EFFECT OF HEAT ON THE CORNEA.

Shahan (1916)[13] gives the following results in his experiments made upon the eyes of animals.

Temperatures of 120° F. (48.9° C.) for 10 minutes removed the epithelium over the area heated, while 116° F. (46.6° C.) does not cause clouding, desquamation or any other pathologic results.

Temperature of 128.4° F. (53.5° C.) applied for 10 minutes causes slight clouding of the substantia propria which clears up entirely in about 17 days.

Temperature of 128° F. (53.3° C.) applied opposite the iris for a period of 10 minutes causes atrophy of that portion of the iris under area of cornea treated, noticeable in about two weeks, the iris being gray, somewhat shrunken and drawn towards the filtration angle.

Temperature of 152° F. (67° C.) applied for one minute causes complete destruction of epithelium which replaces itself in 4 or 5 days; the deep clouding slowly diminishes and in several months is difficult to make out except by oblique illumination and magnification.

Temperature of 170° F. (77° C.) applied for one minute does not cause any necrotic changes in the cornea.

When a constant temperature is applied to the anterior surface of the cornea, the posterior surface reaches a constant level in about one minute.

COMPLICATIONS.

Posterior synechia present in 7 cases (28%) on admittance. On discharge only 2 cases (8%) showed posterior synechia.

Perforation of cornea in 4 cases (16%) including one case in which iris was also prolapsed and later excised.

Hernia of Descemet's membrane (but no perforation) in 2 cases (8%).

Secondary glaucoma present in 1 case (4%) which was followed by perforation of cornea.

TREATMENT.

A. LOCAL TREATMENT. Irrigations of Mercurophen 1:8000 used every 2 to 4 hours for its bactericidal action.

Instillations of optochin 1% every 3 to 4 hours in ulcers due to the pneumococcus.

Holocain 2% every 2 hours when pain was present.

Atropin 1 to 2% t. i. d. to every 2 hours to obtain dilatation of iris. Scopolamin one-fourth of 1% used in addition when iris was difficult to dilate.

Moist heat applied for ½ hour periods every 3 hours. Several cases used magnesium sulphate 50% solution. Ice compresses rarely used.

Heurteloup artificial leech was used when congestion was marked.

Zinc sulphate (¼ to ½ of 1%) and silver nitrate 1 to 2% solution were used when conjunctivitis was present.

Formaldehyde 1% solution was applied daily to hernia of Descemet's membrane in one case.

Compress bandage was used only when hernia was present or when ulcer appeared as tho it might perforate.

Eserin, 1% solution, was used under same conditions as compress bandage and in the one case of secondary glaucoma.

Dionin, 2 to 10% solution, t.i.d. and yellow oxide of mercury ½ to 2% b.i.d. was used, to aid absorption after ulcer became regressive.

Puncta and canaliculi were probed when they appeared to be constricted, also sacs irrigated with mercurophen.

B. GENERAL TREATMENT. Rest in bed and free catharsis; usually calomel followed by magnesium sulphate.

Sodium salicylate grains 10 every 4 hours used for ocular and supraorbital pain.

Electric cabinet used to produce sweating in cases showing posterior synechia not relieved by atropin and scopolamin, the patient receiving hypodermic of pilocarpin, grain 1/10. Also inunctions of mercury, drams 1 daily, used to attain the same end.

Diphtheria antitoxin (2000 units) used in one case with no apparent results.

Tonics as elixir of iron, quinin and strychnin used when patient was debilitated and appetite poor.

Inunctions of mercury and the internal administration of potassium iodide were used in the case showing ++++Wassermann, and later the patient was given a course of neosalvarsan.

C. THERMOPHORE TREATMENT. Technic used: 5 instillations each of butyn 2% and adrenalin 1:1000 at 2 minute intervals, under which condition the procedure is entirely painless.

The thermophore is set for the temperature desired, applicator point inserted in the instrument and permitted to remain heated for several minutes to insure proper temperature of the applicator.

A speculum is inserted and the conjunctiva is grasped with fixation forceps to steady the globe, while the thermophore tip is applied directly and somewhat firmly to the diseased area for the length of time required.

In selecting the size of the applicator, one somewhat smaller than the size of the ulcer is used, as the cornea is affected for a distance of about one mm. in all directions from the periphery of the applicator. For an ulcer 4 mm. in dia. an applicator tip of 3 mm. in diameter is sufficient.

When the ulcer is large and has a definite advancing, undermined arc, it usually suffices to apply the instrument to the advancing edge, or arc of the ulcer; in which case it may be neces-

sary in 24 to 72 hours to apply the instrument to some other portion of the ulcer as shown by progressive areas.

To stop the progress of an ulcer, high temperatures are used, with applicator directly applied to the ulcer. One application usually is sufficient to cure.

3 Applications used in 1 case 4%
2 Applications used in 3 cases 12%
1 Application used in 21 cases 84%

Temperature in above cases ranged from 145° F. (63°C.) to 160° F. (71°C.) depending upon the virulence of the infection.

Applications—

1	145°F. (63°C.)	for	45 seconds
1	150°F. (65½°C.)	for	45 seconds
1	150°F. (65½°C.)	for	1 minute
1	152°F. (67°C.)	for	45 seconds
1	152°F. (67°C.)	for	1 minute
2	155°F. (68°C.)	for	1 minute
1	156°F. (69°C.)	for	45 seconds
2	156°F. (69°C.)	for	1 minute
4	157°F. (69½°C.)	for	1 minute
2	158°F. (70°C.)	for	1 minute
14	160°F. (71°C.)	for	1 minute

To stimulate regression and absorption, lower temperatures are used in contact with the ulcer; or higher temperatures used, but the applicator held at a little distance from the ulcer. Stimulating applications resorted to in seven cases, one application in each case.

3 Applications at 160°F. (71°C.) for 45 seconds to 3 min. close to, but not in contact with ulcer.

2 Applications at 140°F. (60°C.) for 45 seconds to 1 min. in contact with the ulcer.

1 Application at 145°F. (63°C.) for one minute in contact with ulcer.

1 Application at 148°F. (64°C.) for 45 seconds in contact with ulcer.

D. Operative Treatment. Optical iridectomy performed in one case, two months after ulcer had healed on account of the marked opacity of the cornea following a very virulent infection with staphylococcus aureus and pneumococcus type IV.

Iridectomy and conjunctivo-keratoplasty were performed in one case, following perforation of a marginal ulcer, due to staphylococcus aureus.

Conjunctivo-keratoplasty used alone in one case on account of the bulging of the floor of a marginal ulcer due to diphtheroids.

Extirpation of the lacrimal sac was done in three cases; one case 5 days, one case 12 days, and one case 16 days after admittance to the hospital.

Canthotomy in one case on account of the spastic entropion and undue pressure of the lids on the globe.

Visual Results.

Case No.	On Admission	On Discharge
1	L.P.	H.M. at 1 M.
2	L.P.	6/12
3	L.P.	H.M. 2 M.
4	6/21	6/9 + 3
5	6/15	6/9
6	L.P.	6/60
7	5/60	6/15
8	6/60	6/15
9	H.M. 1/3 M.	6/60
10	H.M. 1/3 M.	6/15
11	6/21 — 1	6/6 + 3
12	L.P.	6/12
13	6/60	6/21
14	1/60	6/9 — 2
15	H.M. 1/3 M	3/60
16	H.M. 1/4 M.	6/60
17	F. 1/3 M.	6/60
18	6/30	6/30 + 1
19	Shadows	H.M. 1/3 M.
20	6/21	6/15 + 1
21	6/21	6/5 — 4
22	6/30	6/15
23	6/15	6/9 — 1
24	4/60	6/30
25	F. 1 M.	3/60

Case Reports.

Resumé of three cases, fairly typical of the mild, moderately severe and severe cases, treated with the thermophore.

Mild Type. Case 4, M. S., a Polish school girl, aged 12, first seen Sept. 23, 1922, complaining of photophobia of left eye. Condition began three weeks ago, following an injury to cornea by a foreign body. Has been treated at another hospital for past two weeks.

Examination. Vision R. = 6/9 L.= 6/21.

R. External and internal examination negative.

L. Both lids moderately swollen and reddened, palpebral fissure nar-

rowed. Conjunctiva, both palpebral and bulbar moderately injected. Marked pericorneal injection present. Cornea shows an ulcer 4x3 mm. down and in, extending from 6 to 9 o'clock 1 mm. internal to limbus. Ulcer stains over area 4x3 mm. The ulcer itself is superficial but the area about the ulcer shows deep infiltration in the substantia propria. Superficial blood vessels from the limbus extend to the ulcer above, below and nasally. Iris dilated from the effects of atropin.

Fundus. Media clear, except cornea, bright reflex obtained but no details seen.

Sept. 25th, 1922. Thermophore applied for 1 minute at 160°F. (71°C.).

Sept. 26th, 1922. Very comfortable night, no pain, staining 5x3½ mm.

Sept. 28th, 1922. No discomfort day or night. Staining 2x1¼ mm.

Oct. 1st, 1922. No staining, deep infiltration of cornea has cleared, leaving an area 3x2½ mm., grayish-white in color and rather thin. Conjunctival injection slight.

Oct. 13th, 1922. Very faint bluish white opacity down and in 2½ mm. in diameter. Eye quiet, no synechia present. Vision O.D. 6/6, O. S. 6/9 +3.

Moderately Severe Type. Case 22 W. G. colored laborer, aged 48 yrs. entered Wills Hospital Feb. 24th, 1923, complaining of pain, lacrimation and photophobia in left eye. Condition began three weeks ago with epiphora and slight mucopurulent discharge. Has not had any previous trouble with eyes.

Examination. Vision R. 6/21. L. 6/60.

R. External and internal examination negative.

L. Lids red and slightly swollen, cilia matted together with dried secretion. Meibomian glands are distended, outlets of which are filled with secretion. Conjunctiva, bulbar and palpebral, markedly injected and shows mucopurulent discharge in the cul de sacs. Lacrimal sac free from pus.

Cornea shows an ulcer in lower outer quadrant 4x1½ mm., at 5 o'clock. No undermining, ulcer itself is not deep; but infiltrate grayish in appearance can be seen in the substantia propria. Numerous blood vessels extending from the limbus to the ulcer. Ulcer is 3 mm. internal to the limbus. Ulcer stains thruout. Anterior chamber of normal depth. Iris widely dilated.

Fundus could not be seen on account of the marked photophobia.

Feb. 25th, 1923. Thermophore applied for 45 seconds at 152°F. (67°C.).

Feb. 27th, 1923. Staining 3x 2 mm. comfortable night. No pain, conjunctival injection much lessened.

March 1st, 1923. Staining 1x1 mm., comfortable night. No pain, no discharge and eye whitening.

March 5th, 1923. No staining, no pain, comfortable night. Very slight injection. No discharge. Discharged as cured. Vision R. 6/6, —2, L. 6/5 —4.

Severe Type. Case 6. J. D., an Italian housewife, married, age 72 yrs., entered Wills Hospital Oct. 8th, 1922, complaining of marked pain in left eye and left side of head.

Condition began 10 days ago, starting as a "cold" in left eye, which has continuously grown worse. Has severe pain in left eye and left side of head, pain has been so severe that patient has not been able to sleep. Has had no previous eye complaint, except chronic dacryocystitis and conjunctivitis of left eye, which has been present for several years.

Examination. Vision R. 6/20, L. Light Perception.

R. External and internal examination negative.

L. Upper and lower lids markedly swollen. Pressure over lacrimal sac shows regurgitation of a mucopurulent discharge. Conjunctiva, palpebral and bulbar, markedly injected.

Cornea shows an ulcer 3½ mm. in diameter down and in, yellowish white in color, no undermining present. Deep infiltration of cornea in substantia propria beneath and surrounding ulcer. Area of staining 3x4 mm. Hypopyon present 1½ mm., in height.

Pupil displaced upward and does not react to light or accommodation. Posterior synechia present, pigment deposits on anterior surface of lens capsule. Tension ++.

Fundus. No reflex obtained.

Oct. 8th, 1922. Thermophore applied at 160°F. (71°C.) 1 min.

Oct. 10th, 1922. Staining 5x4 mm. Deep in cornea yellowish infiltrate present. Very little pain. Comfortable night. Marked improvement of inflammatory signs.

Oct. 12th, 1922. Staining 4x3 mm. Hypopyon 1 mm. in heighth. Iris dilating. Very little pain. Comfortable night.

Oct. 16th, 1922. Staining 3½x1½ mm. Hypopyon ½ mm. in height. Very little pain. Comfortable night.

Oct. 18th, 1922. Staining 3½x1½ mm. Hypopyon has absorbed.

Oct. 20th, 1922. Extirpation of lacrimal sac under ether.

Oct. 24th, 1922. Staining 1 mm. in diameter. No pain. Comfortable night. Very slight swelling over region of sac.

Oct. 30th, 1922. Discharged. Very slight injection of globe. No pain. No staining. Opacity 3½ mm. in diameter, grayish white in color. Pupil under atropin shows a minute synechia at 11 o'clock. Scar from sac operation very faint. No regurgitation of secretion from pressure over region of lacrimal sac. Tension normal. Vision R. 6/20, L. 6/60.

Conclusions.

The thermophore is practically a specific in the treatment of socalled infected corneal ulcers, relieving pain, stopping progress of the ulcer, and insuring the best possible visual results.

In a small percentage of the cases only, is it necessary to reapply the instrument, in which instance it is applied to the progressive area only.

At lower temperatures (120° to 140°F.), the thermophore is useful, to hasten regression and absorption.

Relieves pain; the patient in the vast majority of instances enjoys a comfortable night's sleep and rarely has a recurrence of the pain after application of the thermophore.

Hypopyon rapidly absorbs, following the application of the instrument.

Results have been very favorable in uninfected ulcers (e. g. dendritic keratitis) as well as infected lesions of cornea.

No eyes were lost in this series, in no case was the vision on discharge less than on admittance. In fact, every case showed an improvement in vision.

The application of the thermophore is not painful.

For infected ulcers, temperature of 158° to 160° F. applied for 1 minute, gives the best results.

Clinically the ulcers due to the staphylococcus aureus and those due to the pneumococcus, cannot be differentiated, both being of the serpiginous type.

I wish to thank the members of the surgical staff of the Wills Hospital for their kindness in permitting me to treat and report their cases.

McBain Building.

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CILIA IN THE ANTERIOR CHAMBER.

OTIS ALLEN SHARPE, M.S., M.D.

CLINICAL INSTUCTOR IN OPHTHALMOLOGY, STANFORD UNIVERSITY MEDICAL SCHOOL.

SAN FRANCISCO, CALIFORNIA.

The history of this case includes an injury to the right eye at five and the left eye at twenty-three years of age. When seen at thirty-eight he had a scar in the right cornea and complete cataract in the left eye. R. seemed to be suffering from low grade uveitis. The cataract was removed from the left eye but signs of irritation recurred in the right. Study with the microscope showed two short fibers lying on the iris which proved to be pieces of cilia. Removal was followed by quick recovery. A review of previously reported cases and bibliography are added. Prepared for the Section on Ophthalmology of the California State Medical Society, meeting of 1923.

The writing of this paper was stimulated by the discovery of cilia in the anterior chamber of an eye. I thought I had happened on something quite rare. However, my enthusiasm was only slightly less when I looked up the literature and found 75 similar cases reported within the last 100 years. That number is, indeed, very small for that period of time. I believe I am justified in reporting this case; first because of the rare occurrence of such cases; secondly because of the great length of time the cilia were borne without causing complications, and thirdly because of the peculiar, misleading symptoms of the case.

G. C., a large healthy male, age 38, seen April 4, 1918, came complaining of failing vision of the right eye. He stated that the left eye had long since been almost useless and that if the right continued to fail at the same rate at which it had in the last few weeks, he would soon be blind.

History. General health good. Had usual diseases of childhood. At age of 5 years was injured in the right eye by the peg of a top which struck the eye with considerable force. The eye was punctured: an operation was performed which, so far as I was able to make out, was an iridectomy. It cleared up in a few weeks, leaving a scar of the cornea, with good sight so far as he knew. His vision must have been good for he stated that he served in the U. S. Army for a period of four years, during the Spanish American War. For the past 3 or 4 years has experienced from time to time a feeling of "something in the eye," at which times the eye became red and sensitive to light. This condition of the right eye did not give him any considerable trouble until within the last three months, when the painful attacks became more and more frequent with increasing severity each time. He also noticed that the sight began to fail. It was his idea that it had failed rapidly within the past 4 or 5 weeks.

When questioned about the loss of vision of the left eye, he stated that 15 years previous while at work a piece of shattered glass struck it causing the formation of a cataract within a few months, resulting in loss of vision except for light perception. Aside from being blind the eye had given no trouble.

Examination. Right eye: The lids were held partly closed as if to shield the eye from the light. There was very slight ciliary injection and also injection of the bulbar conjunctival vessels. There was nothing found tc account for the feeling of foreign body in the eye. The surface of the cornea was uneven in such a way that it had a coarsely stippled appearance. The upper part of the cornea bore a large scar or leucoma to which there was attached a large anterior adhesion of iris. There was an upper coloboma of the iris which I presume was the result of the operation about which he spoke. The pupil reacted well to light and during convergence. The undisturbed portion of the iris dilated under the influence of homatropin. The lens, not clearly seen, viewed thru a somewhat hazy cornea, seemed fogged thruout. The fundus, which was poorly seen, showed no abnormalities, altho 2 or 3 large vitreous opacities could be made out on movement of the eyeball. Vision O. D. 20/50, not improved with lens.

Left eye: Cornea clear. Pupil gave

an opalescent reflex, was slightly irregular, reacted well to light and during convergence. Dilatation with homatropin revealed some small posterior synechia and a well matured cataract. The fundus could not be seen. About 5 o'clock just behind the limbus was a small slit like dialysis of the iris about 2 mm. in length and less than 1 mm. in width. Thru this aperture an orange fundus reflex was obtained. Vision O. S.—counts fingers at 10 feet. Light perception and projection was good for dim light. X-ray was negative for foreign body in either eye. Blood Wassermann was negative. Urinalysis showed no abnormal findings.

General physical examination showed no abnormalities except small right inguinal hernia and a peculiar atrophic condition of the finger nails, which the patient claimed was due to subjecting the hands to strong brine for a period of several months.

The right eye seemed to be suffering from a low grade iridocyclitis. The patient was put on atropin and dionin treatment with hot fomentations.

He was next examined on September 2, 1919, when it was found that the right corneal opacification had increased to such an extent that the vision was 20/200. There were slight signs of irritation, viz.: pericorneal injection, photophobia and epiphora. The left eye remained the same as when first seen.

As it was evident that the sight of the right eye was rapidly failing, a cataract extraction for the left eye was decided upon. The operation used was the combined method. I operated the eye September 5, 1919. I did subsequent needling operations on October 3, 1919, and January 23, 1920. On January 29, 1920, the vision with correction by lens was 20/30. At the present writing, May 14, 1923, the vision of the operated eye is 20/15 with a +12.50 sphere combined +2.00 cylinder axis 180°. He also reads finest Jaeger test type at 14 inches with a +3.00 sphere added.

During the time of operation and recovery of the left eye, the right eye remained somewhat quieter than before, altho it was not entirely free from symptoms, the cornea had become slightly clearer, the vision having improved was 20/200 and the lens opacity seemed to have increased, altho this was rather uncertain.

However, the patient returned on February 27, 1920, again complaining of a feeling of foreign body in the right eye. Examination revealed no foreign body. There were as before the usual signs of irritation: redness, watering and photophobia. The eye was thoroly atropinized and kept so for a few days when the symptoms and signs entirely disappeared. The patient returned again on March 16, 1920, with his old complaint. The eye was atropinized and as usual the trouble disappeared. He was again seen on the 15th. The eye remained quiet. He reported again on March 18, the symptoms having returned.

By this time my interest was thoroly aroused. I called an associate in consultation. He found nothing in addition to what I had already found. The case was very puzzling, indeed. Nothing had been found to account for the feeling of foreign body unless it was the anterior synechia and this was not very likely. We next began to study the eye by means of an ocular microscope and after spending some time discovered what looked like two short fibers lying upon the iris. Both were obscured somewhat by the corneal scar behind which they extended upward. The larger one lay vertically to the nasal side of the pupil. The other was temporal to the pupil and nearly parallel to the first. They resembled rather closely the iris markings and it was only with focal illumination and magnification that they could be definitely made out. Both of us agreed that they resembled eyelashes more than anything else. Here we thought lay the explanation of all the trouble.

Surgical removal of the supposed cilia was decided upon. On March 19, the cornea was incised at the limbus with a keratome and by means of an iris hook, the two objects were removed. They proved to be eyelashes devoid of their bulbs. Recovery was quick and uneventful

ful, but the patient returned on March 30, with his old complaint along with the usual signs of irritation. Thoro search was made again for cilia in the anterior chamber, but none could be found. The only thing to which I could now attribute his trouble was the large adhesion of the iris to the corneal scar. I therefore decided to perform a synecotomy. This was done on April 2, 1920. When the corneal incision was made a lash came down from beneath the leucoma to the opening and was partially expelled by the outflow of aqueous. It was easily removed with a pair of forceps. Examination revealed another short lash extending behind the scar. I grasped it with a small pair of serrated forceps but it could not be dislodged. The root was firmly attached to the scar. Further attempt at removal resulted in breaking off a piece about ½ cm. in length. The remainder I could not get. I now severed the broad band of iris. The recovery from the operation was rapid. Upon discharge from the hospital on April 4, the feeling of something in the eye had entirely disappeared and the eye has remained quiet to date. The cataract has developed to full maturity. The cornea has become much clearer, altho still hazy. The corneal surface is still irregular and uneven. The eye is entirely quiet and gives him no trouble. Vision consists of light perception and projection of light is good and in case of necessity a cataract extraction might be done with fair visual results. I believe the cilia were the whole cause of the trouble.

REVIEW OF THE LITERATURE.

A partial review of the literature upon this subject gave a number of cases which were similar to this one. My case had four cilia in the anterior chamber, while the numbers in the cases reported ranged from one to fourteen.

Hamilton McElroy[1] reported a case where a cilium was found subconjunctivally near the limbus. The patient complained of defective vision. Five months previously the eye had been injured by the explosion of a shell. The eyeball had not been pierced. The symptoms were feeling of foreign body and irritation which cleared upon the removal of the cilium.

J. R. Smith[2] of Chicago reported "A Case of Laceration of the Eyeball with an Eyelash Driven into the Lens." The patient was a carpenter. The cornea was lacerated by a splinter which penetrated the lens causing a cataract, a cut in the iris with formation of an anterior synechia. An iridectomy and lens extraction was done. The lens showed a cilium driven thru its center.

A. E. Bulson[3] reports a case of rebounding wire striking the eye: vision was lost immediately. There was blood in the anterior chamber which cleared soon—one month later, five lashes were seen in the anterior chamber lying on the anterior lens capsule. Four months later the symptoms were pains, photophobia, redness and lacrimation. Operated, cilia removed; symptoms disappeared, eye cleared. Result, corneal scar and vision of 5/200.

Würdemann[4] states that due to accidental or operative injury cilia are carried into the anterior chamber. They may be tolerated for years without giving trouble. They eventually result in photophobia, irritation, pain, ciliary injection, lacrimation and development of epidermal tumors, iris cysts: ultimate glaucoma, blindness or loss of the eye.

Vieweger collected 29 cases from the literature in which he found a number of cilia, as many as 14 in one case. They were carried into the anterior chamber by the perforating objects and were seen floating in the aqueous, or one end impacted in the wound. He states that the lashes may be retained for a long time without irritation.

Muller[5] reported one case with a lash in the anterior chamber for 24 years without symptoms. The case which I have just reported carried the cilia from the age of 5 years to 38 years, a period of 33 years before symptoms became severe.

Two cases of sympathetic inflammation from cilia in the anterior chamber have been reported; one by von Graefe[6], and the other by Curvier[7].

Würdemann[4] reports two cases in which cysts of the iris formed and he says that as cilia are apt to give rise

to iris cysts they should be removed by corneal incision. From the literature it is evident that cases are comparatively rare, (75 in 100 years) and cases in which more than one cilium are found are very rare.

C. P. Small[8] reports a case of a section hand driving a spike, the head of which broke; a piece flew and struck the patient's eye. A few days later while attempting a lens extraction, a cilium was seen in the anterior chamber and removed.

McKenzie[9] was the first to report a case of cilia in the anterior chamber with formation of iris cyst.

Rothmund[10] in 1872, collected 36 cases of cyst of the iris due to cilia in the chamber.

In 1910, Paderstein[11] reported a case in which he attempted to remove a lash five weeks after injury. Four weeks later he attempted to remove another, but was prevented by an iridic hemorrhage. Later the lens became entirely opaque.

1909, Barr reported a case in which a lash had been carried into the anterior chamber during injury 12 years previously. Two weeks before he saw the case, the patient received a blow on the head which caused a subacute iridocyclitis. Examination showed aphakia due to old injury, posterior synechia and an old leucoma, from the posterior surface of which a cilium extended back to the lens capsule.

H. L. Begle[12] of Detroit reported three cases. Case 1, had a single lash in the anterior chamber. Five weeks after the injury the wound which contained the base of the cilium suddenly showed evidence of local irritation. The patient experienced a feeling of foreign body. The condition persisted for a week when the eye became quiescent. Three months later the eye was still quiet with a vision of 1/10. Patient refused operation for removal and was not seen again. Case II, a furnace tender, chipping brick, was struck in the eye by something; two days later was examined. No recent scar was seen. The eye was tender to touch with increased tension. There was evidence of an old penetrating injury. One cilium was discovered in the anterior chamber; attempt at removal was not successful.

GENERAL DISCUSSION.

The following is a discussion summed up from the literature which I reviewed upon this subject and from my own experience.

In perforating injuries of the eye, cilia may be torn from the lid margin or even cut off and carried along with an object into the eye. Also during intraocular operations the lashes may be cut by the knife and carried into the anterior chamber or in fact into any part of the globe. While transplanting of cilia due to injury is rather frequent, it is of very rare occurrence during operation, but has been known to occur. Therefore, eye operators and especially beginners, should bear such a possibility in mind.

Probably the commonest type of injury where cilia are carried into the eyeball is when the penetrating body does not remain, but passes on thru into some of the surrounding tissue and leaves the cilia behind, or, after piercing the eye, the injuring object is withdrawn. The metal or other fragment may proceed on to the vitreous and leave the cilia in the anterior chamber. Very likely in the case which I report the cilia were torn from the upper lid by the peg of the top and carried into the anterior chamber where they remained. Very often the cilia are fixed in some way in the anterior chamber. It may be by adherence to a corneal scar, contact with the iris, by being caught in the chamber angle, or by being embedded in an organized blood clot, lens material or exudate. Less often are they found free and movable in the aqueous of the chamber. The presence of cilia in the chamber is apt to be overlooked as very often they lie parallel to the iris markings which they resemble very closely or may be obscured by the presence of corneal scarring. Focal illumination and binocular magnification greatly facilitate in locating them.

One would naturally think that there would be great danger of intraocular infection following the transplanting of cilia into the eye, however, this does

not seem to be so as shown by the cases reported. On the other hand, cilia in the anterior chamber are well borne for a long time without serious reaction. The patient here reported carried the cilia for a period of 33 years without serious results. The next longest period found was the case of Muller, which was 24 years.

The explanation of the lack of infections following these accidents may be the rapidity of filtration of the aqueous which is detrimental to the development of bacteria. Or it may be, as is shown by actual experiment, that the eyelashes seldom harbor pathogenic bacteria. However, it is possible for infection to follow transplanting of cilia into the anterior chamber. This is shown by Hirschberg, who cites two cases where a circumscribed purulent inflammation cleared after removal of implanted cilia.

In spite of the fact that cilia have been known to remain in the anterior chamber for many years, it is my belief that eventually they will cause irritation and consequent inflammation, and should be removed as soon as discovered except in certain special cases to be mentioned later. The complications caused by their presence, of course, are roughly those which might result from the presence of any inert foreign body, viz.: recurring irritation, mild inflammation, feeling of foreign body more or less frequently. This latter is probably due to contact with iris or cornea. In my case the feeling of foreign body always discontinued when the pupil was immobilized by atropin dilatation. This led me to believe at first that the patient was suffering only from a mild attack of iritis. Partial expulsion of cilia from the anterior chamber, probably due to long continued irritant action on the cornea at the point of contact has been noted. Mild attacks of iritis with exudates caused by periods of scratching or friction of the iris with the cilia, have been noted. Also, if the cilia happen to be in contact with the lens capsule, a cataract may result.

Rothmund in 1871 collected 37 cases of cilia in the anterior chamber with epithelial cysts or pearl tumor formation. These formations result from a proliferation of the epithelium of the root sheaths of the eyelashes and subsequent degeneration with formation of fat and cholesterin globules. These tumors are often attached to or in contact with the iris; they may enlarge so as to impinge upon other structures causing inflammation, hypertension and visual disturbance; they may lead to cataract formation and opacities of the cornea. It has been shown experimentally that living epithelium transplanted into the anterior chamber may continue to grow and form pearl tumors or cysts.

Cilia remaining in the anterior chamber for some length of time often undergo certain changes in appearance. They are due to bleaching, by combined action of the aqueous and light; splitting of the hair or separation of the cuticle; and to the deposit of salts and albumin from the aqueous. On two of the cilia which were removed from the eye of Mr. G. C., there was a thin coating of tenacious gelatinous material. It is stated by Wagemann that thru giant cell formation cilia may be eventually absorbed. Microscopic examination indicates that there may be some pigmentary deposits upon the cilia as a result of inflammation of the iris and uveal tract.

When cilia have been introduced into the anterior chamber by perforating injury and there follows pus formation or plastic inflammation, they should be removed at once. Whatever may be the source of infection I believe the presence of hairs, altho under some circumstances well borne by the eye, will add to the inflammatory condition. Where the inflammation is confined to structures with which the cilia are in immediate contact, the removal is very apt to result in prompt recovery. Even in cases where the cilia are causing no recognizable disturbance it is my belief that they should be removed, especially if it is not possible to keep the patient under observation. In certain cases it may be allowable to delay the removal until such time as a cataract is removed, or until the performance of some other necessary procedure.

The removal of cilia from the eye is often attended by some difficulties. The most frequent complication is the tendency of the iris to prolapse due to the rapid outflow of aqueous upon making the corneal incision. An excellent means of preventing such a complication is to eserinize the eye well before operating. Another complication may arise by the cilia lying in close contact with the iris, thus there is great danger of picking up a fold of iris with the operating instrument. Very good instruments to use in removal of cilia are an iris hook with a well rounded and polished end and a fine forceps with serrated edges for grasping. If the eye is well eserinized, the proper instruments used, and much time and care taken, I believe removal of any portion of the iris will be unnecessary unless possibly the cilia are attached to it by exudate or some other means. Suffice it to say that no part of the iris should be removed unless it is absolutely unavoidable because of the great visual disturbance which follows. Sometimes the cilia, if floating free, are engaged in the corneal incision or washed entirely out of the chamber by the outflow of aqueous upon making the corneal incision.

The character and location of the corneal incision will, of course, be determined by the position of the cilia, the position of any complicating factors such as anterior or posterior synechia, exudates, blood or corneal scars.

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NOTES, CASES, INSTRUMENTS

THREE CILIA IN THE ANTERIOR CHAMBER FOLLOWING TRAUMA.

WALTER SCOTT FRANKLIN, M. D.
FREDERICK C. CORDES, M. D.

SAN FRANCISCO, CALIF.

The presence of a cilium in the anterior chamber has recently been reported by several men. The following case seems sufficiently unusual to warrant its publication.

Mr. H. S., age 22, consulted us on June 25th, 1924, with an eye injury sustained but one hour previously. He stated that after cutting a piece of fine wire from a spool, suspended from the ceiling, the end sprung back from above and struck him in the right eye. He was thrown to the floor and writhed in agony. The vision was at once greatly impaired and the eye became extremely painful.

Examination revealed a penetrating wound above the pupillary area, extending completely across the upper third of the cornea, with the iris adherent to its posterior surface. The aqueous was very turbid, due to hemorrhage. Just above the pupillary area, on the iris, a small dark linear foreign body could be seen. The patient was extremely nervous and became faint frequently, so that exact observation at that time was impossible.

From the history and examination an X-ray was deemed necessary and

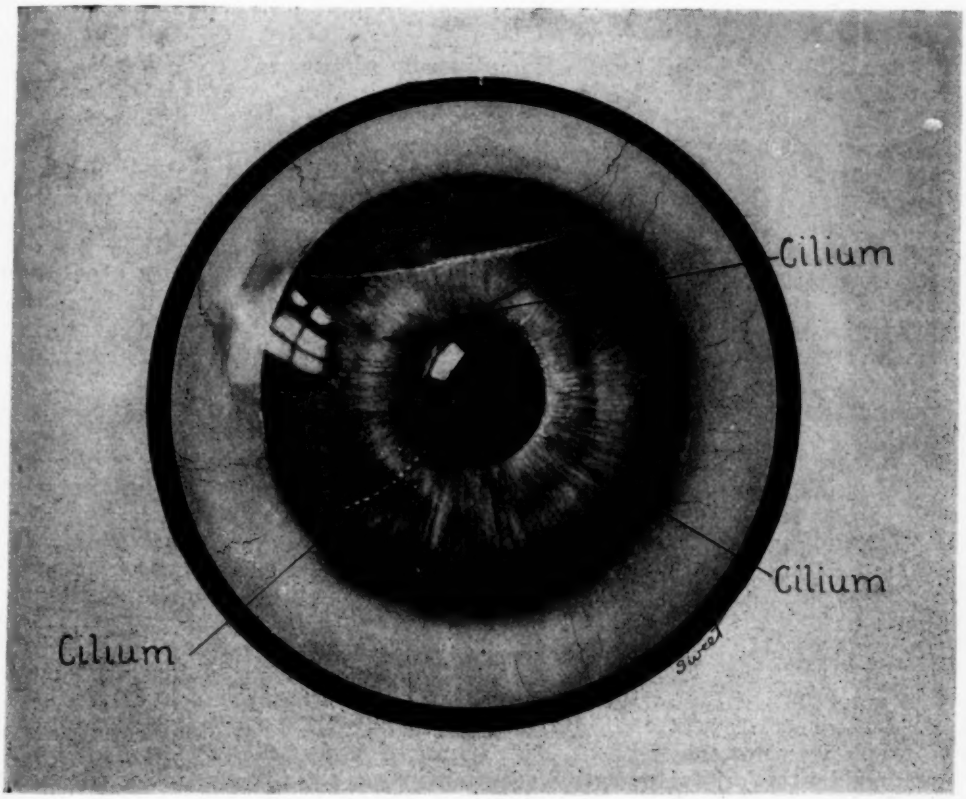
the patient was sent to the Roentgenologist, who reported back that the plates were negative. Upon his return, he was more composed, so that a more detailed examination under the corneal microscope could be made. At this time it was determined that the foreign body was a cilium. In addition a second cilium was observed on the iris, below and nasally, while a third small foreign body was noted on the inferior pupillary margin.

At the time of operation, at Stanford Hospital next morning, the aqueous had cleared, so that the cilia could be distinguished without difficulty. The small third foreign body placed below, was found to be the end of a cilium protruding thru the pupillary area, with its greater portion lodged between the iris and lens. The cilia were removed with some difficulty, as they had become adherent to the iris and were incorporated in the new formed exudate. The iris was replaced without difficulty and healing progressed uneventfully.

The patient was discharged the middle of August, vision, with correction, in the injured eye being 0.8+. Examination revealed a linear scar across the superior third of the cornea of the right eye, covered by the upper lid; iris slightly irregular; reacting well; lens and fundus negative. Left eye negative.

The sharp end of the wire must have sprung back with a sufficient force to cut off the cilia and carry them into the anterior chamber, where they remained when the wire recoiled. It is rather remarkable that the lens should escape injury in a penetrating wound of this type. It is also of note that the cilia should be driven into the chamber thru the corneal wound.

The description of the case does not emphasize the problem of diagnosis. The sensitive patient and negative radiogram were somewhat puzzling at first.



Cilia in anterior chamber. (Franklin and Cordes Case.)

AN ORBITAL GROWTH.

MAJOR R. E. WRIGHT, I. M. S.

MADRAS, INDIA

Abdul Khalig, Muhammadan, male, age 3 months, was admitted to the Out-patient Department of the Government Ophthalmic Hospital on April 7, 1924. The parents stated that they first noticed a small lump between the inner angle and cornea 8 days before; this history, however, is unreliable. The swelling rapidly grew and pushed the eye down and out. When first seen there was very marked proptosis with swelling and edema of the lids, dilatation of the superficial veins and a tense glazed appearance of the skin of the upper lid in the superior nasal region. The cornea was clear; no evidence of fundus disease was noted except edema of the nerve head.

At first sight the condition gave the impression of orbital abscess; and within a short time of the patient's arrival in the Out-patient Department, an exploratory puncture was made in the superior nasal quadrant of the orbit, thru the conjunctival fornix. About an ounce of a thin fluid mixed with blood was aspirated. A small incision was made along the line of the needle puncture and some small portions of a friable tissue were obtained. The incision led into a ragged walled cavity, the anterior wall of which at its most prominent part was about 5 mm. thick. It was soft and lymph gland like in consistence, and lay close under the conjunctiva. There was no definite capsule.

Pending the parents' decision as to whether or not the tumor might be removed, the small portions of tissue were examined and found to be lymphosarcomatous. It was observed whilst attending the case that the cavity of the tumor filled up repeatedly with a clear fluid, which on investigation proved to be cerebrospinal fluid. The parents would not consent to operation and took the child away, and it was not possible to follow up the case. It is regretted that an X-ray photograph was not taken.

Presumably the orbital growth had established communication with the subdural space. But without actual exploration, or postmortem examination, it is impossible to say exactly whether the growth started in the orbit and invaded the cranial cavity by erosion of the bony wall, or invaded the orbit from an extraorbital site of origin.

A CASE OF TRAUMATIC ANIRIDIA.

EDWARD J. BROWN, M. D.

MINNEAPOLIS, MINN.

The case of traumatic aniridia reported by Dr. John R. Rogers in the AMERICAN JOURNAL OF OPHTHALMOLOGY, December, 1924, suggests that a case of my own may be worth reporting.

June 16, 1908, E. C. B., 49 years old, carpenter, was drawing lumber from a platform higher than his head. A board slipped and the end struck his left eye and inner orbital margin. I saw him after about an hour and found a short cut at the inner end of the superior lid, an apparent comminuted fracture of the nasal process, a short triangular rupture of the cornea at the superior external quadrant, thru which protruded a long shred of iris, and the anterior chamber full of blood.

With slight tension on the iris tissue it was removed with scissors, atropin instilled, and a compress applied. On the following day the anterior chamber was clear of blood, the corneal wound closed, the iris absent except for a small tag at the superior outer quadrant, vision 20/200 and the coarse field good.

On July 3d the eye was white and correcting lenses gave V., R. 20/15, L. 20/30. The nasal side of the left disc gave a suggestion of a slight retinal detachment.

In 1919 vision was 20/40 with his old lenses, and the fields were both considerably contracted. There was no further examination at that time.

In 1921 the old lenses gave 20/70 and 20/50 and the addition of plus one D. to each lens gave 20/20 in each eye. The fields were practically unchanged, and the tension 22. With the left lens a slightly smoked glass there had never been any discomfort.

SOCIETY PROCEEDINGS

Reports for this department should be sent at the earliest date practicable to Dr. Harry S. Gradle, 22 E. Washington St., Chicago, Illinois. These reports should present briefly scientific papers and discussions, include date of the meeting and should be signed by the Reporter or Secretary. Complete papers should not be included in such reports; but should be promptly sent to the Editor as read before the Society.

ROYAL SOCIETY OF MEDICINE, SECTION OF OPHTHALMOLOGY.

DECEMBER 12TH, 1924.

PRESIDENT SIR ARNOLD LAWSON.

Postoperative Result of Conical Cornea.

MR. ELMORE BREWERTON showed a patient who came to him three years ago with conical corneae, the right eye being the worse. He did the crucial incision thru the apex of the cone of one eye (he proposed to operate on the other eye shortly). Vision in it, with correction, was 6/24, (6/18 partly), whereas in the other eye it was 6/60. If the apex was below the center of the cornea, it was well, he said, to go obliquely, i. e., down and in. If it coincided with the center of the cornea, the incision was made horizontally. If the aqueous escaped, the second and third incisions must be made with small scissors with blunt points. The flaps were lifted up separately, and the blunt pointed scissors passed by the side of the repositor. No tissue was removed. As a rule, the anterior chamber reformed in five days. It was essential to have the iris fully dilated under atropin.

Bilateral Uveoparotitis.

MR. VINER showed a patient with chronic iridocyclitis associated with considerable enlargement of glands. He believed oral sepsis was responsible for both conditions.

Lower Half of Field of Vision Lost in One Eye.

MR. MCMULLEN showed a patient with this defect, and said that when he saw her, six weeks after she first noticed loss of sight, there could be found nothing to account for it, except that he observed a little opacity of the retina above the macula, and that the disc was somewhat pale. When taking the fields he found complete loss of the lower half of the field of the right eye. A physician found that the patient had mitral stenosis, hence it was likely that there had been an embolism of the upper main branch of the central artery of the retina.

Recurrent Retinal Hemorrhages.

MR. MCMULLEN also showed a patient who was subject to recurrent retinal hemorrhages, for which no cause could be found. These subretinal and retinal hemorrhages had been spreading further into the retina, with progressive failure of sight.

Gradual Disappearance of Cysts of Iris.

SIR RICHARD CRUISE exhibited a patient who had had two large cysts of the iris. Two years ago, when he showed it to the Section there was much discussion as to what ought to be done. They had, however, been slowly getting smaller since, and now were quite small.

Modified Motais Operation.

SIR RICHARD CRUISE also showed a patient on whom he had performed a modified Motais operation. He was a big man with very heavy eyeballs and congenital ptosis. The superior rectus was functioning, and the speaker split it, and dissected back a broad slip from the central portion of the muscle, leaving only the margins attached to the eyeball. He dissected that back ¼ to ½ an inch, giving a good long thong of muscle. It was firmly secured in the muscle by a double threaded suture. He then split the tarsal plate at the posterior margin, and brought the thong of muscle thru the tarsal plate, and sutured it there firmly. There was now excellent functioning of the pseudolevator palpebrae. The man now had nearly full movement, and was able to walk about and see comfortably.

Discussion. SIR WILLIAM LISTER said he would hesitate to do the operation for fear a foreign body might get between upper lid and globe.

MR. TREACHER COLLINS said this operation was only suitable for cases of ptosis in which the superior rectus was active. The cases in which he had done it had been unilateral ones. He did not go thru the tarsus, but thru the retrotarsal fold, then burrowed with a strabismus hook between skin and tarsus and planted a piece of rectus muscle, which was sutured into that burrow, and the sutures were brought up on the skin near the palpebral margin, and a little piece of rubber tube tied in. He was much helped in the operation by using half-curved needles.

Marginal Dystrophy of the Cornea.

MR. FRANK THOMAS (Swansea) showed two patients with marginal dystrophy of the cornea. One of them showed the ultimate condition found in this disorder, namely, marked peripheral ectasia of the upper half of the periphery, leaving the central area distorted, and by the displacement forward, a high degree of myopia developed. Vision in the right eye was 6/18, in the left 6/35 with correction. Neither of these patients suffered from discomfort, except for the loss of vision, which, in the worst case, extended over 10 years, in the other, two years. Both men had suffered from bloodshot eyes.

Discussion. MR. TREACHER COLLINS agreed with the diagnosis, tho the appearances in the two patients were, at the present time, strikingly different. He had examined both these cases with the slit lamp. The man with ectasia showed the ribbon of light in the cornea definitely incurved on the posterior surface, indicating a thinning of the cornea in that region. The man with the opacity showed thinning at the anterior surface, or what might be termed a slight grooving. Ectasia caused considerable astigmatism. The case recorded by J. H. Fisher was treated by excision of a thin piece of cornea at the margin, and the result was almost satisfactory, tho it seemed a hazardous proceeding. He, the speaker, did not advise excision of a piece here.

Papilledema in a Myope.

MR. A. LEVY showed a patient whom he saw four years ago with 8 D. myopia in each eye. Vision at that date was about 6/9. The man came again three weeks ago, still a myope, with vision 6/36, and a flaring optic neuritis in both eyes, and the disc swelling —1. It had been stated, he said, that a myope never got papilledema.

Cases of Leber's Atrophy.

MISS IDA C. MANN showed, for MR. LESLIE PATON, a patient with Leber's atrophy, whose four brothers had also been shown before the Section with the same condition. There were in the family 6 brothers and 4 sisters. None of the women were so affected. The oldest brother was affected at the age of 28, the next at 33, the next at 27, and the next at 22, and the present patient at 43. A brother, now aged 34, was not yet affected. Four sons were among the offspring, but none yet affected. In reply to a question by Mr. Frank Thomas, she said the skiagram of the skull showed no definite enlargement of the sella turcica.

Pituitary Tumor.

MR. MONTAGUE HINE showed a man with this condition. There was seen to be a definite enlargement of the sella turcica. He had been under thyroid treatment two months, and during that time vision was reduced from 6/12 to 6/60, and the field had become worse in the right eye. In the left eye, however, vision had improved from 6/60 to 6/24, and in the left lower temporal quadrant of this eye the field had improved. He asked when operation should be advised, if at all.

THE PRESIDENT said the mere diagnosis of the presence of a pituitary tumor did not constitute a sufficient reason for operation. In illustration he quoted the case of an officer who in 1916 had a large pituitary tumor and marked evidence of dyspituitarism. After much consultation it was decided not to operate, but to administer pituitrin. Seen eight years later the sight had not got worse, but if he ceased the pituitrin he was worse until it was resumed. In another case in which no operation was done there was some im-

provement in vision after a time, the likely explanation being that growth was proceeding in another direction, so that pressure on the chiasma was diminished.

MR. M. S. MAYOU did not agree that what the President said applied in all cases. In one of his own, Professor Harvey Cushing, when in this country, did a decompression operation, with much benefit. The patient had acromegaly, and that disease progressed, but the operation relieved the pressure on the chiasm.

MR. FRANK THOMAS referred to a case of the same kind which he treated with small doses of pituitrin and thyroid, but without benefit. When seen, the sight of one eye had been quite lost, and in the other there was complete temporal hemianopia. The dose was then increased to 10 grs. thrice daily for a month, and the two lost fields were restored, the vision remaining at 6/6. After a time a further increase in the dosage had to be made, until 15 m. thrice daily was being taken. He was then able to resume his duties as postman for a year. After that he went downhill, and died.

Other cases were also shown.

H. Dickinson, Reporter.

THE NETHERLANDS OPHTHALMOLOGICAL SOCIETY.

Translated from the Tydschrift f. Geneesk., March 31, 1923, by E. E. B.

AMSTERDAM, DECEMBER 17-18, 1922.

PROF. J. VAN DER HOEVE, IN THE CHAIR.

Action of the Ciliary Body Under Homatropin and Cocain.

H. J. FLIERINGA (Leiden) read a paper which will appear in the literature as his Doctorate Thesis.

Discussion. ZEEMANN asked if curves obtained from partial paralysis did not suggest that the coincidence with the line of Hess is apparent and casual. Also the question arose if the investigator would not have succeeded with further practice in associating the accommodation and convergence so that the first mentioned curve would rise still more at the end, coinciding with the vertical line of Otto Roelofs.

FLIERINGA stated that the determination of the relative near and far points in the manifest accommodative region, has taught that the lines which connect these points run, not parallel with the convergence of Donders, in the lower part of the diagram. However, they do not run parallel with this line in the upper part of the region of manifest accommodation. This is explained by the fact that the latent divergence within 15 cm. from the eyes seems pretty constant. It has been demonstrated that the lines of the relative near and far points in the region of the latent accommodation, with partial paralysis of the ciliary muscle run fairly parallel with the divergence line of Donders. The curve of the relative near points in the manifest region will surely rise more with exercise in dissociating the connection between accommodation and convergence: and, as has been mentioned, at the end it can fuse with the ordinate of the maximum of divergence. He expected that this will appear if the diagram of the relative accommodation extent in the manifest accommodation region would be made by Otto Roelofs.

Location of Visual Field and Field of Regard.

C. OTTO ROELOFS (Amsterdam) referred to the description of Landolt of a simple way of determining by the hands the direction in which visual impressions are localized. Roelofs tried following Landolt's principle to make a better and more accurate instrument; so that the place of the localizing eye becomes better fixed and the localizing with many retinal points for different directions of regard can be examined. As a careful examination of physiologic circumstances was necessary, he began with the examination of his own eyes and reached the following conclusions:

1. A visual point is localized by R. more to the left and by L. more to the right. This probably depends on his exophoria, which means that we have to reckon with the heterophoria of our patients.

2. The localization of L. agrees the best with that of our body and of the median plane thru the body. Perhaps this is also an individual phenomenon, as Roelofs considers his left the directing eye.

3. The localization by binocular vision agrees with that of L., which also demonstrates that his left eye takes a preponderance.

4. In estimating distances in the visual field, equal distances in the neighborhood of the fixed point are valued greater than in the periphery.

5. Equal distances in the visual field, are estimated greater in the temporal than in the nasal half. The 3 and 4 are known and very general. Their explanation cannot yet be given; a directive may be found with hemiamblyopia, where the distances in the amblyopic half seem smaller. The peripheric parts of the retina are amblyopic compared with the central, while it is generally accepted that the temporal half of the visual field is less valuable in comparison with the nasal. This is supported by 6.

6. The estimation of distance in the visual field with binocular vision agrees in the right half with that of R., and in the left half with that of L.

7. The certainty of localization in the periphery of the visual field is nearly as great as in the center. This is rather remarkable, if we compare the decrease of the visual acuity toward the periphery.

8. The certainty of localization of L. is somewhat greater than for R. This may be an individual phenomenon.

9. The certainty with binocular fixation is somewhat greater than that of R. and agrees nearly with that of L.

Examination of the localization in the monocular and binocular field of regard gave the following conclusions:

1. In estimating the movements of regard equal distance in the center of the field of regard are considered larger in the periphery. The difference is, however, small and certainly much smaller than between center and periphery of the visual fields. The consequence is, that with successive fixation of different points in space, a sham motion of the visual points must appear; which Roelofs can easily observe.

2. Similar regard motions are estimated with R. somewhat larger than with L.

3. The estimation of a binocular movement of regard is somewhat larger than that of one eye of the same extent. Perhaps this depends on more exertion necessary for binocular vision in the lateral regard direction.

4. The certainty for fixing the periphery of the field of regard is as great as in the center.

5. The certainty of localizing in the different parts of the field of regard is somewhat larger for R. than for L.

6. The certainty of localizing in the different parts of the field of regard, with binocular vision, is greater than that of R. and agrees with that of L.

Results regarding the localization of the hands were also secured:

1. The left hand is localized more toward the left, the right more to the right. When one tries to put the hands, without seeing, on the same place, the left hand is put more to the right with respect to the right hand. This very general phenomenon may be explained by the localization of the hands being strongly dependent on experience. This localization of both hands reciprocally is probably acquired by holding objects with both hands. If an object is lacking and we wish still to bring the hands on the same spot, the superfluous adduction innervation will result in a small adduction motion, which brings the right hand more to the left compared with the left hand.

2. The localization of the right hand agrees best with the localization of our body, and of the median plane thru our body. This is connected with right handedness.

3. The estimation of motions of the right arm and hand agrees with that of the left side.

4. To the left of the median plane motions of the right hand are estimated somewhat larger; to the right of the median plane it is the opposite. Perhaps adduction is somewhat more difficult than abduction.

5. The certainty of localizing the right hand is, in general, the same as for the left hand.

6. The certainty wherewith the right hand localizes a visual point in the right visual field is very much greater than that for a point in the left visual field. Also the certainty wherewith the left hand localizes in the left visual field is much greater.

If we first represent the position of the visual point, close the eyes and then give the localization with the hand, this difference is found absent. The important difference with the eyes kept open depends, perhaps, on our acting automatically so that we do not represent entirely consciously the position of the visual point and of the hand, but more the stimuli which reach us thru the visual organ; and those from arm and hand which we try to bring in harmony. This occurs with greater certainty when these two groups of stimuli reach the same cerebral hemisphere.

It is allowed within certain limits to use the hands as instruments to measure the localization with the visual sense organ. Only the relative localization of a visual object with respect to the localization of the invisible hand at that place is determined. So that one only can come to the relative localization of different points visible in space with respect to each other; and that we cannot speak of a localization with respect to the median plane.

We must examine the directions which we will compare in one sitting; as the localization with regard to our body (the socalled absolute localization) can change from day to day. The number of observations must be large enough for computation of a fair average, and care must be taken that head and trunk remain in the same position. A new factor is introduced in turning movements between head and trunk, which can change the estimation of the arm movement. It cannot yet be explained, altho we may remember the tonic cervical reflexes of the ocular muscles (Bárány, de Kleijn) but especially the tonic cervical reflexes of the muscles of the limbs, demonstrated by Magnus and de Kleijn in some experiments on animals.

Discussion. De Kleijn said that Roelofs has already pointed out that it is necessary to keep the head symmetric with regard to the trunk. It would be desirable that Roelofs examine his experimental cases carefully for pointing spontaneously; as well as while looking in different directions, in connection with the reactions of Fischer-Reinhold.

Marx asked if Roelofs had done the fixing of the center with the fixed or movable eye and if such experiments have been done in the dark where orientation by surrounding objects is absent.

Roelofs thanked de Kleijn for his remarks, and answered Marx that it is necessary between two observations to move arms and eyes freely to avoid repeating the same error. Experiments in the dark were not tried.

The Pathologic Fundus Picture of Purtscher.

F. Wibaut (Amsterdam) read a paper on this subject.

Discussion. Halbertsma asked if foci outside the papilla and macula are localized on account of the greater resistance of the gliomatous elements in these places.

Van der Hoeve observed that perhaps examination by Koeppe's method would show rupture of the lymph vessels. He wished to advocate that the interpretation of a roentgenogram of the orbit should be done by the ophthalmologist.

Examinations in Ophthalmology.

Prof. G. F. Rochat mentioned that a new regulation of university education will come before Parliament and that no examination in ophthalmology will be necessary for getting the right to practice medicine. He wished to know if the members wished to formulate some questions regarding the education of the specialist and what should be required before one could call himself a specialist. A commission was instituted for that purpose.

Epibulbar Sarcoma.

A. W. Mulock Houwer spoke of this and showed lantern slides.

Discussion. VAN DER HOEVE asked if the optic nerve had been only pinched or also had been disorganized by the tumor, and if this could have originated from the dural sheath. He saw no hindrance in accepting a tumor growth against the lymph stream, as something similar is seen in thrombi.

MULOCK HOUWER stated that the optic nerve was only pinched and that the tumor lay outside the dura without intimate connection.

Diffraction.

L. KOEPPE (Halle) explained the part of the diffraction of the light in image formation in the eye. Image formation is always accompanied by diffraction phenomena because the media of the eye are not homogeneous. With Gullstrand's lamp they can be analyzed in distinct and optically different opaque formations which possess a distinct form and produce the conception of an intraocular lattice work. The intracorneal lymph spaces, the radial lattice work of the lens and the spatial lattice work, which exists in the vitreous body, give the observable lattice actions.

The lymph space system of the cornea, which one can represent as a simple crossed lattice work produces a figure of colored rings formed on the retina with an angle radius of about 1.5 degrees for red, and correspondingly projected outward. With conjunctivitis, on account of the cellular elements which cover the cornea, colored rings of about 2 degrees for red are seen. The red is here always found at the outer side, the violet inward.

The normal lens which can be considered a radial lattice work produces around a punctiform light focus, colored rings of about 3.5° to 4° angle radius for red; which some people can observe without pupillary dilatation. The theory of the spatial lattice work refraction of the living vitreous causes rings, which have about 5.5° to 8° angle radius for red. On account of the transparency of the vitreous fibers the rings projected by them do not come into consciousness.

The colored rings appearing with glaucoma and independent of inflammatory phenomena which show the same form and extent can be considered as due to opacity of the fibers during increased pressure, which brings the impression of the rings above the threshold of observation. If inflammatory changes of the cornea exist vesicle formation of the corneal epithelium causes rings of different size, thru differently sized particles which diffract the light intracorneally which produces around the light visible aureoles. In each case with colored rings around lights the angle radius must be measured to prevent confusion with other ring formations not due to glaucoma.

The intraocular refraction theories explain the known phenomenon that in a dark room a grayish-violet elliptic ring is visible around a red glowing lamp, which goes thru the fovea and the papilla and is intersected at the place of the papilla. Siedentopf found it produced thru the section by the retina of a light cone refracted by an intraocular object. Koeppe considers the axial suture of the lens to be the linear refracting object. The lens fibers of the radial lattice work can be considered discontinuous rows of points, which all together bend aside the cone. If the eye looks toward the nasal side the ring becomes smaller, and larger on looking toward the temporal side. This is explained by the slanting position of the lens suture which is directed from backward nasalward, to forward temporalward. In this way relatively the opening angle of the refracted ray cone increases, thru change of the direction of regard against the axial suture. This proves the phenomenon produced by diffraction of the cone wave.

A fourth intraocular diffraction phenomenon has the form of many radial extensions of a different light source in the retinal image and can be explained by the light diffraction at the fine edge of the pupillary margin.

Koeppe then referred to polarization of light thru the fine intraocular tissue parts. The new course of the rays which occurs with the other diffracting phenomena within the eye, causes such a polarization of the light inclusive of

the cone wave. At the conclusion he spoke of the role of the diffraction of the light in producing absorption of light, thru the finer tissue particles causing the selective coloring of the parts.

Discussion. SCHOUTE found that patients did not perceive colored rings at the time of examination. He asked if the mathematic computation was so accurate that rings of 3° to 5° are a normal phenomenon, and rings of 5.5° to 8° glaucomatous? From other sources, especially from the English larger numbers are given.

ASCHER said it was very interesting that with the perception of the wave cone the part represented on the papilla remains invisible because usually no blind spot is observable.

ZEEMANN asked if we can consider established, the computations for the cornea, also for other systems; and may deduce the laws of refraction thru lenses, from the consideration of these lenses; as built from smallest particles, whose reciprocal distances viewed perspectively decrease toward the periphery. He also wished to know if the extra images seen near the candle flame also are seen with the eye at rest. If not it seems probable that they show the periodicity in the rise of the light impression.

KOEPPE answered: If a refractive system is optically homogeneous, the principle of the circular lattice structure of the living corneal substance cannot be transferred to every possible system of curved surfaces. We cannot represent to ourselves that the homogeneous refracting substances with spheric surfaces are built up from very small particles, whose apparent diameter decreases toward the periphery relative to a point like light in the optical axis, or near it, according to the law of the circular lattice action. The extra images of a light flame are only seen with a somewhat movable flame; on account of the light weakness of the phenomenon the moving extra image appears more clearly thru an increased simultaneous contrast. The gradual decrease of the stimulus could not show such sharp borders of the extra images, especially not with a movable flame.

He knew nothing in the literature of colored glaucomatous rings with an angular radius larger than 8°. Perhaps the diameter was meant. For the other supposition we had to accept a remarkably narrow spatial lattice work of the vitreous.

Investigating the intraocular diffracted wave cone he had found constantly in the region of the blind spot a corresponding interruption. A closed figure was never observed. Investigations about the absence of the phenomenon with aphakia can only be made with very intelligent people, and are yet lacking. However, the explanation of the phenomenon with the wave cone needs no proof.

Subjective Tests of Refraction.

O. HENKER (Jena) spoke of the astigmatism of oblique light bundles, a dangerous source of mistakes in the subjective determination of refraction.

Discussion. HALBERTSMA, SR. was under the impression that the word "verzeichnung" is used when in a rectangular figure the straight lines are seen curved. Is the word also used when a rectangular figure is seen slanting or turned as it seems to have been used in the exposition.

WIBAUT inquired about the strength of the photographic objective used with the experiments, and their influence on the size of the deviations in the sharpness of the image.

THE CHAIRMAN wished to state that the very exact fitting of spectacles yields great advantages, but also a disadvantage in the sense, that the possibility is lost of compensating small errors thru a small displacement of eye or spectacles, and that the possibility of using the stronger peripheral refraction is taken from the presbyope.

HENKER stated that the greatest exactness in prescribing telescope spectacles is needed, because the autocorrection of small inaccuracies is not possible, and agrees that a presbyope sometimes profits from the stronger refraction of the edges even if he has to take astigmatism into the bargain. He opposed the biconvex and bicon-

cave lenses because periscopic lenses are so much better.

Action of Atropin on the Pupil Dilator.

G. F. ROCHAT stated that some phenomena point to the pupillary dilatation as being not simply passive thru paralysis of the ends of the oculomotor in the sphincter pupillae. First the laceration of firm synechiae between iris and lens capsule after instillation of atropin; whereby the pigment layer often becomes detached from the iris and remains on the lens. This can only be done by a rather great force. Secondly the clinical observation that the pupil is only moderately enlarged by oculomotor paralysis when the sphincter action is gone. Here atropin dilates the pupil more.

Rochat wanted, therefore, to examine the action of atropin on sectors from the iris. Such sectors are held by miniature catches in the pupillary and ciliary margins connected with a small myografion, the very light lever of which turned around a watch axis. Its movements were registered and anlarged photographically. The specimen was in Tyrode's fluid and kept at a temperature of 37 degrees C. with a thermostat. All was put in a glass cabinet to prevent air current. Under these circumstances the isolated iris sector remained completely quiet. The automatic contractions described by Ten Cate remained absent. Addition of atropin sulphate in 1 to 30,000 produced, after some thirty seconds, a distinct radial shortening of the iris sector which began rapidly, afterwards more slowly. With higher concentration (1 to 10,000) regularly a lengthening of the segment occurred (paralysis). Atropin therefore has an exciting action in weaker solution, paralysing with higher concentration the dilator apparatus of the iris.

These observations were made with ten irides of cats and once with the same result with a human iris from an eye removed for orbital sarcoma. Rochat showed lantern slides of the apparatus and of the curves.

Discussion. MARX stated that the experiments of Rochat are the counterpart to those of Gautin, who found that pilocarpin sometimes produces dilation in frogs' eyes.

WEVE asked if Rochat considered the traction due exclusively to the action of the dilator, or did he accept also some action of the musculature of the blood vessels. He had observed two cases of clinical sympathetic paralysis, where the cervical sympathetic could not be stimulated electrically and where cocain produced a distinct pupillary dilatation, which appeared about ten minutes later. Would this not prove that cocain does not act exclusively on the dilator, but also paralyzes the constrictor?

ROCHAT thought that this need not be excluded. He replied to Marx that the iris movements seen in normal people chiefly are dependent on the attention; that in case all psychic influences are excluded he looks for the cause peripherally. Such automatic movements are, as a rule, dependent on peripheric ganglia; and these are, so far as he understands, not found by Boeke in the iris. (This was in response to an observation of the movements found by Ten Cate. A. J. O., 1923, Feb., p. 143).

WAARDENBURG asked Weve if his cases of sympathetic paralysis were observed clinically or experimentally. Only in the latter can it be judged if the paralysis is complete or not; and it would be very remarkable if the pupil should dilate thru cocain in a complete long existing paralysis. He has considered the cases in which he has observed combination of sympathetic paralysis and dystrophy of the iris stroma, in which the pupil dilated somewhat to cocain, as cases of partial paralysis. For an exact interpretation of clinical data such a study of the action of these alkaloids as Rochat has begun is to be desired.

In answer to Van der Hoeve's question, if larger doses of atropin have been given, Rochat answered in the affirmative.

Periodic Visibility of Peripheral Objects During Fixation.

G. TEN DOESSCHATE and J. A. VAN HEUVEN remarked that Zeemann and Roelofs had found during their investi-

gations of the struggle of the visual fields that objects outside the center of the monocular field repeatedly became invisible during a short period. Roelofs in a later study spoke of changes in the attention.

The phenomenon has been known since 1804 and goes under the name of D. Troxler. Purkinje, Brewster, Aubert, Snellen and Bosscha, Hess and Dufour, have studied the phenomenon of Troxler.

In the first place it has to be determined if the periodicity is an essential part of the phenomenon, or if it depends on involuntary eye movements, accommodative impulses, etc. If one waits until a periodically situated object has become invisible for the fixing eye, it becomes directly clearly visible with even a very small voluntary eye movement. If, however, one waits during fixation until the object emerges "by itself" it is not so clearly observed and usually disappears soon again. Observations with one single excentric object are insufficient to prove the periodicity of the phenomenon. If two excentric objects are used they will not become invisible simultaneously. Apparently without regularity one disappears, and then the other, to become visible again, each one separately. Such observations would be impossible if the periodicity in the phenomenon only depended on ocular movements.

The weaker the illumination the quicker and more often the objects disappear; the fixation point will sometimes disappear. With such small intensities the objects sometimes disappear without becoming visible again. The extent of the light contrast between background and object has a great influence. The smaller the contrast the quicker the periphery becomes invisible. Aubert's statement that objects at equal distances from the center of the visual fields disappear simultaneously is incorrect. In general the temporal quadrants disappear earlier than the nasal quadrants and the lower quadrants quicker than the upper ones. Hess' opinion that an object disappears the quicker the more peripherally it is situated could not be confirmed.

If a number of white spots are put at a distance of 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50 degrees from the fixation point; then, after a minute's fixation, the most distinct after images are seen in the region between 15 and 40 degrees. The localization of the described phenomena has been determined, curves were plotted which represent the number of obscurations for monocular and binocular vision. These curves are nearly alike. This speaks for localization above the chiasm. The physiologic influence of the oscillations of the perceptibility could not be detected; there exists quite a parallelism with the simultaneous light induction and with negative after images. The studied phenomena can be included in simultaneous induction, with the exception of the changing character. These oscillations are, however, found in the after image process so nearly related to the simultaneous induction.

Discussion. ASCHER referred to investigations of Belehrader who observed during rather long fixation of a radial figure alternating disappearances of opposing sectors, and considered it to be a sign of fatigue of the ciliary muscle which temporarily weakens in different spots and so produces astigmatism. Under atropin the phenomenon disappears.

SCHOUTE had the impression that the phenomena could not be explained by the visual organ. One should rather go back to the simpler senses, as the pain sense, where distinctly the principle can be made out, that on every single impression (stimulus) follows a rythmical perception. With the more complex senses, as the visual sense, the simple impression is lost thru accessory factors, as the attention, contrasts, etc.

Retina and Optic Nerve in Iridocyclitis.

W. P. C. ZEEMANN read an article, published in Graefe's Archiv für Ophthalmologie, Bd. 112, Ht. 2.

Discussion. WAARDENBURG thought that the diagnosis of slight foveolar changes is often quite difficult with the

ordinary ophthalmoscope. With eclipse scotoma he often found nothing, or so slight changes that little could be deduced. This was similar to what Zeemann had seen with the ophthalmoscope. Red free light can help in differentiating between injury of the fovea and the retrobulbar causes of central scotoma. Changes in the yellow coloring, or structure of the fovea are better seen in the red free light. He used a different method from that of Vogt, which is practical in many instances, but he does not know if it is of the same value as that of Vogt.

ZEEMANN replied; that he also hoped much from the examination with the red free light, and did examine with it, especially as Vogt has described macular changes with inflammation of the anterior part of the eye. But his experience is not yet sufficient to be of importance in the question under consideration.

COLORADO OPHTHALMOLOGICAL SOCIETY.

DECEMBER 20. 1924.

DR. W. C. BANE, Presiding.

Blind Benefits in Colorado.

DR. E. JACKSON reported for the committee on blind benefits. As bearing on the need for change in the law, he mentioned especially that the Blind Benefits Commission was not cooperating with the other organizations in the state which were interested in the welfare of the blind, namely the state institution at Colorado Springs, the workshop for the Blind in Denver, the teacher for the adult blind elected by the state board of education, practically acted as an independent department and made a separate report to the board of education. The Blind Benefits Commission, thru the attitude of its secretary, was carrying on a sort of warfare with the school at Colorado Springs and the workshop in Denver.

Opaque Nerve Fibers, and Hyaloid Remains.

G. F. LIBBY, Denver, presented a boy, aged six years, whose left eye had been found by school examination to have almost no vision. The right eye was normal. In the left eye the fundus details were very obscure, scarcely any vessels showing; but the picture at the posterior pole of the eye was vaguely that of a much enlarged, irregularly shaped, and nonvascular nervehead, with trailing filaments in the vitreous. It was thought possible that the condition was one of an unusually large area of opaque nerve fibers, together with fetal hyaloid remains.

Discussion. EDWARD JACKSON, Denver, agreed with Dr. Libby's suggestion, and thought that the area of opaque nerve fibers reached into the macular region. It was, however, possible, altho not probable, that the condition vaguely seen was retinochoroidal exudate. A more satisfactory view was obtainable with the indirect method.

W. C. BANE, Denver, suggested that it was desirable in every case to use the indirect before the direct method of ophthalmoscopy.

Copper in Posterior Wall of Eye.

L. L. HERRIMAN, Alamosa, presented a youth who nine weeks previously, on shooting at a padlock twenty feet away, had felt something hit his eye. There was an iris coloboma with anterior synechia, and the lens was fairly opaque. There had been a mild uveitis. X-ray plates showed an opaque body near the median line and perhaps in the posterior wall of the eye. Should the lens be needled, and was there danger of sympathetic ophthalmia? There had been no pain, and the treatment so far had been limited to the use of atropin.

Discussion. F. R. SPENCER, Boulder. I should be in favor of needling the lens so as to get a view of the fundus.

EDWARD JACKSON, Denver. The wide excursion of the foreign body upon turning the eye upward is in favor of the fragment being firmly attached to the eye, either in or outside the sclera.

E. R. NEEPER, Colorado Springs. I do not particularly fear sympathetic ophthalmia in this case. There seems to be a partial absorption of the lens to one side, and it may not be necessary to needle the lens.

J. A. McCaw, Denver. In a case of attempted suicide which I saw at the Denver General Hospital, fragments of the bone were demonstrated by X-ray as being in the back of the eye, but the eye gradually quieted down, and it was thought well to take no action.

W. H. Crisp, Denver, spoke of the case of a boy whose eye had been penetrated by a fragment of a dynamite cap. The parents had been told that it might be advisable to needle the opaque lens after the inflammatory reaction subsided.

C. E. Sidwell, Longmont, spoke of a similar case in which after some time the lens was gradually absorbed, so that in a few months time all that remained was lens capsule, and the patient obtained normal vision with a plus ten sphere.

Several speakers expressed themselves as believing that the foreign body must be copper, in view of the mode of occurrence of the accident.

Penetrating Steel Fragment.

W. M. Bane, Denver, presented a man, aged thirty-two, whose right eye had been struck with a fragment of steel while he was using a hammer on September 10. The vision of the injured eye was of the hand as a moving object. There was a perforating wound in the margin of the right upper eyelid about 3 mm. to the nasal side of center, and a vertical wound thru the sclera 3 mm. long, located 5 mm. above the nasal margin of the cornea. By X-ray, a foreign body 1.5 by 2.5 by 3 mm. in size had been located in the orbit above and to the nasal side of the eye, and magnet examination had also demonstrated that the foreign body was not in the eyeball. After five days from the injury the hemorrhage into the vitreous had become partly absorbed, and vision had improved to 5/60; but since that time the vision had failed so that it was practically limited to light perception. The vitreous contained some organized exudate, and floating yellowish-white tissue. No further treatment seemed indicated as regards the foreign body. Unfortunately the patient had removed his goggles just before the accident.

Discussion. C. E. Walker, Denver. The remarkable thing to me is that so apparently slight a traumatism should cause so much loss of vision in this eye.

W. F. Matson, Denver. It is the terrific blow that the eye received almost over the ciliary body, and the resulting hemorrhage from the ciliary body, that has destroyed this eye.

G. F. Libby, Denver. It is not too late to hope for improvement after a year or more in such a case.

W. C. Bane, Denver, thought that the foreign body had cut into the sclera back of the posterior margin of the ciliary body, and that the hemorrhage was due to the foreign body having severed a fair sized vessel.

Opaque Nerve Fibers.

W. M. Bane, Denver, showed a man who had come in for refraction, and whose eyes presented remarkably large areas of opaque nerve fibers, extending fully three-fourths of the way around the optic discs. The vision was almost normal without correction, and quite normal with.

Retrobulbar Neuritis or Recurrent Hemorrhage.

G. L. Strader, Cheyenne, Wyoming, presented a woman, aged thirty-nine years, who had come on account of gradual falling off of the vision of the right eye. There had never been any pain. The vision of this eye was 6/100, that of the left 20/20 minus. The right vitreous was very cloudy from dust like opacities, and there were also numerous small dark opacities, round in shape, which changed position rapidly on movement of the eyeball. Along the inferior nasal artery of the retina were several small patches of choroiditis. X-ray examination of the teeth showed the upper right third molar impacted, the upper right cuspid unerupted and lying nearly horizontal, and a baby cuspid still present. There were some fine vitreous opacities in the left eye. No Wassermann had been made, and examination of the urine was negative.

Discussion. G. F. Libby, Denver. Is there any enlargement of the blind spot or a central scotoma for colors?

I should expect a central scotoma for red and green without a white scotoma, in the prescence of retrobulbar optic neuritis.

E. R. NEEPER, Colorado Springs. I am interested to know whether the men feel that Dr. Libby's position in this matter is above question. The cases which I have had which were unquestionably retrobulbar neuritis have not, I believe, shown any greater scotoma for red or green than for white.

EDWARD JACKSON, Denver. I think that chronic retrobulbar neuritis due to poisoning does show such a difference, but not acute cases. In the acute cases I think the color fields do not have much significance, and that if uniform care is put on study of the white field it will give as much information as the test for colors.

DR. LIBBY. Within the last few weeks I have had a case of sudden blindness in which a diagnosis of retrobulbar neuritis was made on the basis of a central scotoma for green and red.

DR. STRADER. What is the opinion as to the influence of the teeth in this case?

F. R. SPENCER, Boulder. The history of trauma in this case may not mean very much. The case was suggestive to me of recurring hemorrhage into the vitreous due to tuberculosis. I should want a Wassermann and other tests before deciding.

D. A. STRICKLER, Denver. In that case would you have a dilated irregular pupil?

W. H. CRISP, Denver, referred to an industrial compensation case in which the strain of a heavy burden thrown briefly upon the patient's shoulders was blamed for a definite neuroretinitis.

DR. NEEPER referred to the very serious damage sustained by an eye which he had shown in October from a cork from an exploding hydrogen peroxide bottle.

Choroiditis.

C. L. LA RUE, Boulder, presented a schoolboy, aged eleven years, who had come complaining of failure of the vision of the left eye for the past few weeks. The right eye had been rendered aphakic two years previously as the result of a penetrating injury, but obtained vision of 6/10 with correction. The vision of the left eye was 6/15, not much improved by correction. The left fundus showed recent and older inflammatory changes in the central choroid and retina, and there were floaters in the vitreous. The choroidal changes were especially marked between the disc and the macular region and in the latter, the disturbances near the disc being recent and still elevated. Various tests and examinations had proved negative, with the exception of enlarged tonsils and cloudy right antrum.

Discussion. D. H. COOVER, Denver, thought that one small area of disturbance near the macular region looked suggestive of a tubercle.

Several members thought that the right antrum was not clear.

EDWARD JACKSON, Denver, thought the lesion rather degenerative than tuberculous or syphilitic, and favored investigation of the focal condition.

Interstitial Keratitis.

W. H. CRISP, Denver, presented a boy, aged fourteen years, who had developed interstitial keratitis of both eyes in March, 1924, one year after being placed under specific treatment for congenital lues which had hitherto produced no symptoms. In spite of several very vigorous courses of arsphenamin and of inunctions, there had been two or three rather severe recrudescences of the corneal condition, first in one and then in the other eye. The patient's general health was excellent and he had been growing rapidly. Later the skin around the eyes had developed an atropin dermatitis. On several occasions the Wassermann test had remained plus four, but within a few days of the date of report, a weakened reaction had been obtained. It was proposed to add a considerable amount of rest in bed to the other treatment. In another patient recently under Dr. Crisp's care, very striking improvement in the eye condition had followed confinement to bed on account of the presence of albumin in the urine following treatment with arsphenamin.

Discussion. D. H. COOVER, Denver,

suggested adding to the treatment the elixir of iodid of calcium compound.

W. A. SEDWICK, Denver, had also had favorable results from this preparation. However, such cases sometimes lasted from one to two years.

WM. H. CRISP,
Secretary.

HOUSTON OPHTHALMOLOGICAL SOCIETY.

DECEMBER 25, 1924.

Extraction of Foreign Bodies.

DR. W. LAPAT showed two foreign bodies, which he extracted from eyes with a Sweet magnet. He used a hot spot battery, which can be rented from any battery concern, instead of the direct current which is here not available. One foreign body was 1 by 2 mm. in size, and the other 3 by 4 mm. The large one was removed thru the original wound, and the small one thru an incision in the posterior chamber. On ophthalmoscopic examination the small foreign body appeared as a piece of gold within the vitreous.

Discussion. DR. E. L. GOAR reported a case of a boy, in whom an explosion of a percussion cap forced copper particles into both eyeballs; the right eye was painful, blind and contained three copper particles as revealed by the X-ray; it was enucleated. In the left eye the foreign body passed thru the eyeball into the orbit; there were posterior synechia at the point of entry; the eye had fair vision.

DR. N. ISRAEL enucleated an eye containing a foreign body because of recurrent attacks of the iridocyclitis.

DR. F. J. SLATAPER told of a case that he saw, in which a bird shot was localized in the vitreous with the ophthalmoscope and removed with a forceps introduced thru an incision into the vitreous.

DR. R. K. DAILY reported a case that she saw recently, in which a foreign body was embedded in the lens of a five year old child for two years; the lens was cataractous; light perception was poor; the eye was absolutely quiet, with no irritative symptoms whatsoever; she wondered, in view of the fact that the eye had hardly any vision, whether it should be subjected to an operation, or left alone.

DR. LAPAT thought that every foreign body should be removed, as eventually it would give trouble.

Refraction.

DR. W. STROZIER outlined his method of trial case examination. He does not urge a mydriatic on patients over 38 years of age; he uses the hazing test; and prefers using plus spheres and minus cylinders in testing.

DR. PULLIAM reviewed the technic of retinoscopy, urging its routine use in order to acquire a high degree of efficiency.

DR. E. L. GOAR read a paper on the use of Jackson's cross cylinders. He finds their use of great help in determining both the strength and axis of the cylinder. The plus one cross cylinder is especially valuable in aphakic eyes. He felt sure that anyone giving them a fair trial would not wish to do refraction without them.

DR. F. J. SLATAPER reviewed the different methods of testing accommodation, and advised a careful study of accommodation in each case, especially in presbyopes. He found it also advisable to test the homatropin cases until their accommodation was paralyzed to within 3/4 of a diopter, before the eye is refracted.

DR. DAILY demonstrated the essential parts of the Zeiss parallax refractometer, which gives an objective determination of the glasses required by the patient at 12 mm. from his cornea. Behind a 6 cm. lens, on a bar is marked the position of the inverted retinal image of the fundus in a normal eye. For every diopter of refractive error this point lies 3.6 mm. further or nearer, depending on the kind of error. For greater accuracy, serves an enlargement of 12 times, and the parallax of the lines on the test disc. For accurate determination it requires a paralysis of accommodation in the observed eye, and dark adaptation in the eye of the observer. If the claim put forth for this apparatus, that after some practice it is accurate to 1/12 of a diopter, is true, it will convert refraction from a scientific into a purely mechanical procedure.

RAY K. DAILY, Secretary.

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M. URIBE-TRONCOSO,
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INDICATIONS FOR CATARACT REMOVAL.

Ever since Brisseau (1706) emphasized the fact that cataract, really, was opacity of the crystalline lens and Daviel (1750) showed how it could be taken out, its removal from the eye has been held to be indicated. Before that, without knowledge of the anatomy or pathology involved, the "couchers" of India had practiced depression of the cataract, to remove it rom the line of vision. The general indication for removal of cataract has always been the impairment of vision caused by lens opacity. Other indications may arise, but this is the chief and common one.

Poor vision *with* lens opacity may not mean poor vision *due* to lens opacity. It is astonishing how much opacity there may be with even standard vision. When the opacity is perfectly obvious and the patient complaining of recent loss of sight, it is very easy to infer that the one is due to the other, and often hard to avoid jumping to a false conclusion. Old scars in the cornea may become more hazy with degenerative changes of age, and the loss of vision be blamed on a lens opacity that has long been present; and the same is true of vitreous opacities that may arise coincidently with those of the lens.

It should be more generally appreciated that senile cataract is often preceded, and its progress is always accompanied by changes of refraction. The lowering of vision is always partly, and may be chiefly, due to the refraction changes, especially in the early stages. Sometimes the error of refraction arising thus is irregular astigmia, not capable of correction by lenses. Often there is some regular astigmia with it, and generally the change is toward myopia; and these errors can be corrected by lenses. Again, in some cases a stronger reading glass, enabling the print to be held closer to the eye, and thus magnified in effect, will make reading again possible, or comfortable. This should always be thought of, when the vision of one eye has been lost; so that a nearer reading distance will not cause any strain of convergence. Poor vision *with* cataract is not sufficient indication for removal of the cataract.

If the vision is impaired in only one eye, the question of surgical maturity of the cataract should be considered. Before the days of asepsis and local anesthesia, the mechanical difficulties and the risks of infection justified wait-

ing, until the physical condition of the cataract, and the reduction of danger from wound infection by smooth and rapid removal of lens substance, gave the best prospect of quick and satisfactory healing. Now that clean removal is rendered easier by local anesthesia, and safety from infection has been largely attained, by better understanding of the factors of danger involved, there is no need of delay for surgical maturity, after the visual indication has become urgent.

When the patient's vision has fallen to the point where accustomed acts and occupation are much interfered with, especially if this is below the vision that will probably be restored by operation and optical correction, there is positive indication for cataract removal. Generally the time for such removal is determined, not by the vision of the eye chosen for operation, but by the vision of its fellow eye. Only when the fellow eye has been lost or damaged beyond hope of useful vision, should the eye with better vision be submitted to even the slight risks of cataract removal, without first trying to improve the vision of the eye that is of less value to the patient. Even when the worse eye is not capable of much improvement, this should be tried before the better eye is subjected to similar risks. Often something can be learned from the course of healing, or behavior of the first eye after operation, that will be of material help in deciding whether the time has come to undertake operation on the other, or in choosing the best form of operation, or postoperative treatment.

Operation for a surgically mature cataract in one eye, when the other eye still retains good vision, must be decided by careful consideration of secondary indications, which do not have to be taken into account when vision is being lost in both eyes.

In general, binocular vision cannot be restored by a cataract operation on one eye. If both eyes have previously had about the same condition of refraction, the wearing of a correcting glass before the aphakic eye will only cause confusion and annoyance. The best that can be hoped for is extension of the binocular field, an important matter in these days of crowded streets and automobiles. But there are cases in which the eye that has become cataractous has been previously very myopic. If it has been myopic 20 D. more than its fellow, it is quite possible that removal of the lens will permit the wearing of a correcting lens before the aphakic eye, that will not cause confusion and may even make true binocular vision possible. Of course, in such cases binocular vision has been impossible for years before the lens became opaque; but in some cases, it may have been established in childhood and the capacity for it still exist, if approximate equality of refraction is restored.

In monocular cataract the matter of avoiding a period of comparative or complete blindness, in case the second eye should be involved or injured, is to be considered; also the probability regarding operative help being available in case the emergency should arise later. The age of the patient should have weight in deciding whether cataract should be removed from an eye while vision remains good in the other. In young people, the value of the extension of the visual field and the chance of securing binocular vision, are greater than in people of middle age or later life; and the prospect of smooth, rapid healing, or of successfully using a smaller corneal incision, is better. On the other hand, the danger of going on to hypermaturity is much greater for a cataract that develops in early life, than for one that begins at middle age or later.

The dangers connected with hypermaturity of a cataract are not very common or great, but they are sufficient to deserve consideration as indications bearing on the advisability of early removal. Calcareous change occurs in a fair proportion of congenital cataracts, not operated on in childhood. It complicates any operation that may be attempted later; and even without operation may end in a disintegration, that causes the dropping into the anterior chamber, or ciliary body, of calcareous particles that cause inflammation, or further degenerative changes.

Absorption of the cortex, leaving a hard nucleus free to fall about in the capsule, may be followed by thickening of the capsule, by escape and complete dislocation of the nucleus, or by secondary glaucoma; things well worth preventing, if this is possible by early removal of the lens. Senile cataract rarely becomes hypermature. The same is true of cataracts that have begun in early life but have shown little change in many years. It is probable that where the epithelium on the anterior capsule remains generally healthy, additional layers of normal lens substance continue to be laid down, in a lens that is partially opaque; so that the danger of hypermaturity is not greater than in an entirely normal lens.

Besides the presence of lens opacity, the indications for removal of a cataract require reasonable certainty that the impairment of vision is not due to errors of refraction, vitreous changes, retinal or choroidal disease, toxic amblyopia, or disease of the visual tracts and centers. The contraindications of infection, local or distant (focal infections), glaucoma and optic atrophy must also be looked for. But, even where no great improvement of vision will result, the danger of retaining a lens to become hypermature, partly absorbed, or dislocated should be considered.

E. J.

EPITHELIAL PHAGOCYTOSIS.

The importance of this subject fully justifies a continuance of its discussion and the failure of the writer previously (A. J. O., v. 7, p. 961) to do justice to the earlier work of Lindner upon it, makes apology and explanation here imperative. The correspondence relative to it, printed in this number, illustrates well how questions of priority arise; and also how complex is the process of grasping a new and important conception of the body reactions to disease; and their equally important implications with regard to diagnosis, therapeutics and prophylaxis.

Lindner's article referring to epithelial inclusions and their significance published in a general medical journal in 1909, and the paper by Pascheff published about the same time, had not been read by the writer until the letters on p. 330 and p. 332 called attention to them. The paper of McKee was known, and Lindner's article, published in the Fuchs' Festschrift of Graefe's Archiv, in 1921, had been skimmed over and parts of it read with more attention, without then catching the significance of the more than a dozen passages that refer to phagocytosis. It is not the discovery of epithelial phagocytosis, but the emphasis placed on the importance of this discovery of Lindner, that constitutes the service rendered by Howard in his paper; and the confirmation of that discovery thru the study of Lindner's specimens and others of his own.

Metchnikoff, who gave phagocytosis place and importance in pathology, was not a pathologist, not a graduate in medicine; but a biologist, who had become familiar with the process of ingestion and digestion of foreign matter in unicellular plants and animals. He recognized the similar process, by which leucocytes mastered the bacterial and mechanical invaders of the body, and suggested for the leucocytes this function of protecting the general organism from injury, that would otherwise be wrought by such invaders. He studied the process in leucocytes by experiment and observation, conceiving it to be a function to be performed especially by "wandering cells;" which serve as the scavengers and patrolmen of the body. This was for them a chief function, their *raison d'etre*. He also traced some share in this work to other cells, more or less closely related to them, the endothelial cells lining the vessels, the cells of the spleen, bone marrow, muscles and nervous system. The "wandering cells" were the "microphages," dealing generally with invading bacteria, the others, "macrophages," disposing of dead cells and body waste.

The chief mistake that Metchnikoff made was in ascribing phagocytosis only to cells of mesoblastic origin. For

them it was a function carried on under normal body conditions. The fully developed normal epithelial cell seems incapable of such a function. That the epithelial plates that cover the dermis and the mucous surfaces of the body have a protective office, has been obvious since the histologic structure of such parts was first recognized. But it has been supposed that this function was purely mechanical; as it is under ordinary conditions. They protected like armor plate, or a Chinese wall to shut out invasion. The view of Metchnikoff left the protective function of the epithelial cells with no biologic significance.

From their earliest recognition, the presence of the gonococcus, or the tubercle bacillus within the cells has been known to be common. Its intracellular position was at one time mentioned, but incorrectly, as diagnostic of the gonococcus. All ophthalmologists who make microscopic examination of conjunctival discharges have seen the gonococcus in that position. But very few have given thought to the question as to whether the cell it was in was a leucocyte or a young epithelial cell; or if the gonococcus were there as an aggressor, or as a captive doomed to death. Undoubtedly McKee appreciated something of the real significance of his observations; but it was Lindner who demonstrated to the profession that gonococci, as cell parasites, thrive and multiply on the surface of the older epithelial cells, and that when found within the younger epithelial cells they are there as prisoners, being killed and destroyed.

The increased proliferation of epithelial cells, under the stimulus of mechanical pressure and friction, is evidenced by every thickening of the epidermis produced on hands or feet from working with a hoe, pulling an oar, or walking with poorly fitted shoes. But it is not surprising that the millions of epithelial cells, brought into action under the influence of bacterial toxins, should have powers of dealing in a different way with the invaders that they are developed to oppose. Such a modification of the ingestive and digestive power, that every young cell possesses, should be expected as a part of the protective mechanism of the body; a first line of defense, that if effectively maintained, prevents the need of carrying on the war against microorganisms within the deeper tissues.

It is easy to see how study of the cell inclusions, recognized by Greeff, Halberstädter and Prowazek in cases of trachoma, should have led to thought about other cell inclusions found in the conjunctiva. Both Lindner and Paschеff were reporting their trachoma investigations, and their studies to make the trachoma inclusion bodies fit in with other observed facts, when they published their first papers that hinted at epithelial phagocytosis. McKee pointed out that it was on the epithelial cells of the conjunctiva still in situ, and not on those floating in the secretion, that gonococci and other bacteria were most likely to be found. Yet the importance of this did not appear until Lindner had worked out the course of bacterial invasion of the conjunctiva.

We all have glimpses of possible truth, conceptions of hypotheses that might have importance as broad scientific theories. But they remain absolutely unimportant until correlated observations, or carefully planned experiments have shown their significance. It was not that he noticed the falling of an apple, or the flash of imagination that conceived a possible connection with the revolving planets, that constituted Newton's greatness, but the developed capacity and patience, that enabled him by years of mathematic calculations and comparisons to explain what men had been seeing in the heavens since the beginning of human history.

Gregor Mendel made his experiments and published them in 1865. Only in 1900 was their importance understood. Then, when Mendel had been dead for 18 years, were his laws of heredity suddenly appreciated and brought to general notice; not by a single great scientist, but in the same year by three of the greatest botanists of the world, working independent-

ly. For 35 years the observations, of widest interest to biologists of any published since Darwin's Origin of Species, lay in scientific libraries unnoticed. Then Mendelianism suddenly took its place beside Darwinism. "The success of a jest lies in the ear of the hearer." The importance of a scientific observation lies in the mind of the reader. Emerson says, "Next to him who writes a good sentence is he who first quotes it."

E. J.

THE ROYAL LONDON OPHTHALMIC HOSPITAL.

In 1805, there was opened at Charterhouse Square, thru the efforts of Dr. Saunders, "The London Dispensary for Relief of the Poor, Afflicted with Eye and Ear Diseases." Two years later its work was restricted to ophthalmic cases. A few years after that it was moved to "Moorfields." In 1814, instruction in ophthalmology became a part of the regular work of the institution, and it has continued to increase in importance ever since. The immense number of English speaking ophthalmologists who had part of their training there, and the still greater number who drew benefits from it thru their teachers, caused "Moorfields" to be famous thruout the world as an ophthalmic center. In 1890, it received a royal charter under the name Royal London Ophthalmic Hospital. Its service having outgrown the capacity of its location and buildings, a new site was secured on City Road from Clayton to Peerless Streets, and a four-story, modern hospital building erected, to which its work was moved in June, 1899. Some recollections of time spent in following its service by American Ophthalmologists in the old "Moorfields" and in its present hospital on City Road, are appended. It will be one of the centers of interest for all who attend the July Convention of English Speaking Ophthalmological Societies. (Editor.)

In 1895 the writer spent four profitable months at the Royal London Ophthalmic Hospital (Moorfields), assisting in J. B. Lawford's clinic. Two surgeons were in charge of the clinic two days each week, aided by many assistants. The surgeons, as now recalled, were Warren Tay, John Tweedy, Edward Nettleship, J. B. Lawford, Treacher Collins, Stanford Morton, Marcus Gunn and William Lang. The attendance varied from 200 to 600 out-patients daily. One week in August it was between 400 and 500 daily.

Skiascopy was done at one meter, with the light behind the patient and using the plane mirror, by Morton's method; whose improved ophthalmoscope was much in favor just then. Collins is especially remembered for his interest in and aptness to teach along pathologic lines, and Lawford and Nettleship for exceptional operative ability. All the surgeons were very faithful to their clinics; and common sense ever marked diagnosis and treatment, and kindness and patience were uniformly shown in handling a rather motley horde of patients.

The material offered for examination and observation in this very large clinic, was of great variety and interest. As the cases were not used for systematic clinical teaching at that time, it was essential to have a good working knowledge of ophthalmology and a position as assistant, to realize, even in a slight degree, the instruction to be had from the enormous material. The surgeons and assistant surgeons were always ready to help earnest and appreciative, but inexperienced ophthalmologists, in their efforts to see what was important or unusual and to interpret what they saw. It was also possible to arrange for special instruction in the various phases of ophthalmic science, in small groups, under a member of the Moorfields staff.

For a guinea, a visiting physician could have the privilege of making the rounds of the hospital with the house surgeon, daily, for a month, observing the medical and surgical treatment of the cases and the results obtained. There were at that time about 100 in-patients of all ages and both sexes. The hospital was old, inconvenient and dark; but the residence staff and nurses fully supported the very excellent work

of the brilliant and devoted men who were sustaining the high reputation of Moorfields and adding new glory to its fame.

George F. Libby.

It was my good fortune to be stationed in London during the last six months of the World War and to have an opportunity of visiting the Royal London Ophthalmic Hospital, "Moorfields," and other ophthalmic hospitals of that city, during that period.

Because many of the attending surgeons were in various branches of the military service, those left were working under the handicap of a small attending staff of surgeons to look after the large clinics. Most of my spare time was spent at the Royal London Ophthalmic Hospital, now situated at City Road, near Old Street. It is housed in a modern building that has adequate space for the handling of large numbers of patients. The first floor is occupied by administration offices, cloak rooms, a class room, library, and large out-patient department connected with adequate dark rooms, refraction space, perimetry room and emergency operating room, where minor operations and the dressings of ambulatory cases are done. The upper floors are devoted to hospital rooms and wards, a pathologic and clinical laboratory and operating theater. The capacity of the hospital is 140 patients and is devoted exclusively to eye cases.

The clinics are held in the morning. At nine o'clock the benches that are arranged in front of the desks of the attending surgeons are thronged with patients. More than 50,000 pass thru this department annually, and in a few weeks a visitor sees a wide variety of ophthalmologic material. I found the attending staff exceedingly cordial and always willing to take time to demonstrate interesting material. Messrs. Collins, Spicer, Lawford, Fisher, Worth, Hudson and Graves were on duty at the time of my visit, and Sir William Lister, Sir John Parsons and others were in the military service elsewhere. All instruction had been temporarily suspended, and the foreign visitors were few in number. When visiting the institution three years later a great change was noted, as there were a large number of foreign students attending lectures and working in the clinic; and the hospital had regained its place as the center of instruction for ophthalmology in the British Isles, and was functioning again as a center for training English speaking ophthalmologists.

The Royal London Ophthalmic Hospital will be one of the centers of interest during the Congress of English Speaking Ophthalmological Societies. No institution in the English speaking world has had a greater influence in the development of ophthalmology and ophthalmologists.

William C. Finnoff.

OMISSION.

From the list of ophthalmologists who have received the certificate of the American Board for Ophthalmic Examinations, as published in the January number (p. 70) there was omitted the name of Dr. Samuel H. Wilkins of Boston who received this certificate in June, 1924.

BOOK NOTICES.

Microscopie de l'Oeil vivant (Microscopy of the Living Eye) by **F. Ed. Koby** of Basel. Paper, 240 pages, with 43 illustrations, Masson et Cie, Paris, France. Price 25 francs.

This is the latest of the noteworthy publications on the eye by French authors. It deals with the early diagnosis of lesions and affections of the anterior ocular segment.

In this a somewhat new field is entered for a French writer, for there has been but little published in this language upon the findings by the corneal microscope with slit lamp illumination. He here brings the sum of knowledge to the notice of his compatriots; also those of us who are cognizant of French, who will do well to examine the book. Parisian publishers do not usually market their wares in bound form; therefore, we have to slit the pages and read as we go along.

Dr. Koby condenses the knowledge

gained from the literature and the results of his own experience in 9 chapters; in which the subject is handled in similar style, considering the special technic for examination of each structure, the normal aspects, congenital anomalies, senile defects, traumatisms and pathologic alterations.

He uses the slit lamp apparatus of Gullstrand, describes the instrument and the technic of examinations, then gives some practice exercises for the debutant. The phenomena of the light reflexes is explained. The appearances shown by the examination of the cornea, conjunctiva, anterior chamber, lens and vitreous are plainly described.

The author insists upon an approved, exact and routine examination which obviates the phenomena of light reflexes and prevents errors in diagnosis.

Certain lesions and structures have not been heretofore considered very much by the French writers, who have passed them by in silence. Some of these are pigmentation of the cornea, the structure of the lens and the vitreous, and the circulation of the anterior chamber, to which this author gives some attention.

On the whole the work is very creditable and shows the advantage of approved routine examination of patients by the slit lamp and corneal microscope, despite the time it takes to make the examinations and the economical inefficiency of the method.

H. V. W.

Surgery of the Eye. A Handbook for Students and Practitioners. By **Ervin Török**, M. D., and **Gerald H. Grout**, M. D., Surgeons to the Herman Knapp Memorial Hospital, etc., New York City. Second Edition, Cloth, 510 illustrations, 101 in colors. Philadelphia and New York, Lea and Febiger, 1925.

This work is intended to furnish a practical guide to the surgery of the eye. To this end, care and judgment have been exercised in selecting procedures which, in the hands of experienced ophthalmologists, yield the best results. To make the description of each operation complete, there are repetitions of text and technic when these apply to more than one operation. "In connection with each instrument not only are illustrations and descriptions presented, but a full discussion of its purpose and technical application is given. Just how the instrument should be held, applied and manipulated during the various steps of the operation is pictured and described, for this knowledge is frequently essential to the success of the operative measure."

The work is divided into two parts: I on General Surgical Methods, including 112 pages; and II on Surgery of the Special Parts, as cornea, sclera, iris, etc. The Second part opens with a chapter of 8 pages on the Surgical Anatomy of the Eyeball giving the exact dimensions and relations of the parts that the ophthalmic surgeon must know; and special chapters open with sections on the surgical anatomy of the special parts. It is a work well fitted to help its reader to become a skilled operator, but it recognizes that the ophthalmic surgeon must be more than an operator. The pathologic conditions for which each group of operations are intended are discussed, with the methods of examination necessary for a proper diagnosis; and the indications and contraindications for each procedure are pointed out.

The first edition was published 12 years ago. This edition has been completely revised and reset, containing fewer pages but more text than the first. The number of illustrations is just the same, altho more than one hundred of them have been changed. Most of these changes have been the discarding of photographic reproductions and substituting semischematic drawings which more clearly explain the technic. The two colored plates of the first edition representing fundus conditions have been omitted, the "illustrations in colors" simply have the positions for the incisions indicated by red lines.

In the first edition many of the illustrations were designated as, "The American Method," or, "The European Method," respectively. Now these are better designated as the method with

"The Surgeon standing behind the patient's head," and "The Surgeon standing in front of the patient."

In certain chapters the changes in the operations described is very noticeable. Thus for removal of the lens, the intracapsular operations of Smith, Stanculeanu, Knapp, Török and Barraquer are now all described. In the chapter on operations on the eyelids, the great advances in plastic surgery brought about by the war are adequately considered.

This work still justifies the characterization of it in the introduction by Arnold Knapp; it is, "a conservative and sound guide to ophthalmic surgery." E. J.

Deutsche Ophthalmologischen Gesellschaft. Bericht ueber die 44 Versammlung in Heidelberg, 1924. A. Wagenmann, secretary. Paper, 340 pages, 43 illustrations, 5 plates, 4 in colors. Munich, J. F. Bergmann.

This volume is a worthy successor to the long series of transactions this society has issued. Altho not so large as some of its predecessors, it indicates much scientific activity on the part of German speaking ophthalmologists in the last two years; mostly along the lines of their previous studies. Thus Engelking and Wölfflin report investigations bearing on color blindness; Kestenbaum, Hertel and Salzer on perimetry; Pfeifer, Igersheimer and Lenz on the visual tracts and oculomotor nucleus; Baurmann, Serr, Thiel and Hamburger on intraocular pressure and glaucoma; Birch-Hirschfeld, Meisner and Hessberg discuss the ocular effects of certain radiations; and various operative procedures are described and discussed by Axenfeld, Elschnig, von Grosz, Sattler, Thies, and Stanka.

The outstanding discussions are: on glaucoma, 19 speakers; on operations, 16 speakers; on perimetry, 12 speakers, and on two theoretic papers on refraction, by Vogt and Waetzold, 11 speakers. The importance of insulin therapy in ophthalmology was brought forward by Grafe. There are many other familiar names in the table of contents of this volume, whose bearers presented clinical papers. Among them are Uhthoff, Botteri, Lauber, Loehlein, Jess and Pascheff. The number of formal papers, presented at four sessions, was 46; and in addition there were 11 demonstrations before the session devoted to them. From the list it appears that 211 members of the Congress were in attendance, and in closing the meeting Prof. Uhthoff pointed out that the society, coming back to its birth place with a different name, had not changed its character, but was still the old "Heidelberg Congress."

The illustrations in these transactions are not numerous, but the five plates in this volume are a valuable record of the cases they represent. Two of the plates illustrate a paper, by Weve, on uric acid keratitis, of which he reports two cases. One case presented crystals in the cornea, and one of the plates is a reproduction in black and white of their appearance under the corneal microscope. The second plate, in colors, shows the general appearance of two of the diseased eyes. Plate 3, in colors, shows copper staining of the cornea in a case reported by Jess. The particle of copper had been embedded in the eye for six years. The greenish deposit in the cornea was located in the endothelial cells adjoining the membrane of Descemet. Plate 4 represents the angle of the anterior chamber stained by copper remaining in the eye. Plate 5 illustrates a case of luetic papule, complicating chronic parenchymatous keratitis.

E. J.

Optotypes, consisting of Test-Letters and Pictographs for Measuring the Acuteness of Vision. By **John Green,** M. D., LL. D., and **A. E. Ewing,** A. M., M. D., with thirty-five engraved plates, published by C. V. Mosby Company, St. Louis, 1923.

Since the publication by Jaeger, in 1854, of his wall chart, and the elaboration by Snellen, in 1862, of a more scientific form of letters and the technic especially adapted to clinical requirements for the determination of

visual acuity, a number of more or less scientifically arranged letters and pictographs have been published.

These Optotypes of Green and Ewing eliminate unequal ratios of gradation, simplify the routine and enlarge the scope of clinical determinations, while they minimize differences in the legibility of the several test-letters thru a conservative change in the typographic character.

It differs from the socalled Boston block-letter capitals, which are practically the same as the test-letters of Snellen. The character used by sign-painters in the United States as "New York" block-letter capitals, with shorter finishing strokes, the letters being made up, wholly or in part, of straight lines, of an open construction, in a more uniform relation of width and height and more nearly equal legibility of the several letters at long range.

Pictographs likewise accompany the test-letters, which are particularly applicable as visual tests for children. The test-letters and objects are printed on card board, and arranged in a folio, which is readily changed during examination. They are portable and particularly adapted for clinical work at hospitals or private calls. These will be of marked advantage to any ophthalmologist.

H. V. W.

CORRESPONDENCE.

Epithelial Phagocytosis.

To the Editor:

In your article "Epithelial Parasitism and Phagocytosis," (A. J. O., v. 7, p. 961, Dec., 1924) I find a mistake concerning my position as to the phagocytosis problem by epithelial cells. Will you allow me to bring forth the development of this important question to avoid further confusion?

In one of my first articles, (Wiener klinische Wochenschrift, 1909, Nr. 50, "Uber den jetzigen Stand der Trachomforschung," S. 1745, first paragraph) I described the appearance of the epithelial smear in gonoblennorrhea, the turflike growing of the germs on the cell surface and the real phagocytosis of germs by the epithelial cells, especially in the newborn. Furthermore I stated that this phagocytosis of germs by the epithelial cells makes a confusion possible with the real trachoma inclusions, especially when the germs are already degenerating inside the cell.

This statement is repeated in several further publications. In the article (Gonoblennorrhoe, Einschlussblennorrhoe und Trachom, v. Grafe's Archiv für Ophthalmologie, 1911, Bd. 78, S. 367) I emphasized in the first line the great diagnostic importance of the turflike growing of the gonococci on the epithelial cells, making from now on a Gram stain superfluous. I agree that in these old articles I mentioned the phagocytosis of bacteria by epithelial cells, only incidentally.

McKee's article (The Ophthalmic Record, 1912, p. 4) puts forth the same facts, only he made the mistake of considering all germs connected with epithelial cells as lying in the protoplasm of the cell. He only mentions germs lying inside of the epithelial cells; and in doing so he refers to the two microphotographs as typical examples of his new observation. But both pictures also show pavement cells with the typical turfs on the surface. Until now pavement cells have not been observed to act as phagocytes.

On the other hand I must state here, that McKee was the very first one, who mentioned in his short article that pneumococci and diplobacilli behave to the epithelial cells as gonococci do. It is unfortunate that Dr. Howard puts my later work into a parallel with the findings of McKee.

The full theory of epithelial parasitism of all germs causing purulent conjunctivitis I developed first in the article, "Uber die Topographie der Bindehautkeime," (Zeitschrift für Augenheilkunde, 1919, Bd. 42, S. 30). The remaining research work regarding the phagocytosis of the germs by epithelial cells I published, 1921, in the article, "Uber die Topographie der parasitaren Bindehautkeime," (v. Grafe's Archiv für Ophthalmologie, Bd. 105, S. 726). The way of phagocytosis, the time when it starts, the kind of epithelial cells which phagocytate

the germs and the role which phagocytosis plays in the cure of the disease are there discussed quite fully for the different germs, partially printed in italics. If I should try to bring here all the sentences which discuss the phagocytosis by the epithelial cells, it would fill more than two pages of print. I am inclosing a reprint of this article.

I must say that I was perhaps myself to some extent guilty of this confusion concerning my part in this investigation. When Dr. Howard sent me a copy of his manuscript last August I did not object. In the first place, influenced by the great pleasure, to see my work put into discussion, I did not pay so much attention to these unhappy sentences and did not realize their result. I objected only to one sentence in the third paragraph, mentioned later on and even this insufficiently. I was perhaps too much influenced by the grateful friendship I felt for Dr. Howard. Besides he wrote in his accompanying letter that it would be too late to make any changes in the text. This was my mistake.

I do not want to minimize Dr. Howard's merit at all. He was the first one who recognized the importance of my findings. He worked almost the whole material thru by himself. The overlooking he gave of this work is a masterpiece of accuracy and instructive value. He added many new details to these problems. He developed the new theory that trachoma inclusions are due to the same process of phagocytosis as is the case with other germs, only that the trachoma virus starts to develop inside of the cells instead of being destroyed. At last, I am ashamed to say, that I was not conscious of the fact that phagocytosis by epithelial cells was not known, up till now, to general pathologists, and has therefore quite a principal importance for general pathology. It was Dr. Howard who pointed this out to me and to this he refers in his article, page 909, 3d paragraph, "but the importance of which he admits he did not recognize."

I have a feeling of great gratitude for Dr. Howard because he is the first one to put my work into discussion, and for this I wish to thank him.

Trusting that I have clearly brought forward the inaccuracies of the abstract preceding Dr. Howard's article, and of your editorial, (page 961) wherein you credit Dr. Howard, under the influence of several unhappy sentences in his article, with a discovery entirely my own.

I remain very truly yours,

Dr. K. Lindner, Vienna, Jan. 9, 1925.

To the Editor: Dr. Karl Lindner of Vienna has kindly sent me a copy of a letter which he recently sent you. In this letter he questions a certain editorial interpretation which you place upon my article entitled, "The Rôle of the Epithelial Cell in Conjunctival and Corneal Infections," which appeared in the JOURNAL, December, 1924. I am not called upon to make a reply, but in justice to Dr. Lindner I feel that I should make a statement which you may use if you see fit.

I do not make the claim in my article that I am the discoverer of epithelial phagocytosis. I did not state who was the discoverer, because I really did not know. In reading your editorial I do not interpret it as acclaiming me as the discoverer, as Dr. Lindner thinks you have done. I take it that you attach a certain importance to my paper, in that I revealed among other things the significance of this phenomenon, in a manner not hitherto adequately described or explained.

When I began my work with Dr. Lindner, a year ago, and contemplated the preparation of a paper on his findings for publication in English, I was confronted with the knowledge, that altho his first paper on "The Topography of the Parasitic Bacteria of the Conjunctiva," had been published five years before, and his second paper three years before, no corroboration, up to that time, had been made of his findings; nor had they even been hinted at in the literature, either of his own language or of any other language (except an abstract or two and an article by one of Lindner's younger colleagues, Dr. Pillat, on "The Conjunctival Saprophytes"). Under such circumstances one must admit that I had to have very strong convictions, based upon extensive and intensive observations of my own, to permit me to put my name above an article on the subject.

As I endeavor to make plain in my article, I repeat again that I received every courtesy and bit of assistance from Dr. Lindner that one could desire. He explained his methods and technic in the greatest detail; showed me his specimens and pointed out the various phenomena, including epithelial phagocytosis, which he had observed and about which he had written. I then gave myself intently to the investigation of the whole problem, for my time for it was limited to three months. It seemed quite essential for me to work the whole material thru by myself. I became quickly convinced of the accuracy and the importance of Lindner's published findings. As day after day I saw the various phenomena in my own specimens, I marvelled that these things which had been seen and known in a hazy manner by numbers of men in years gone by, had not long ago stimulated immediate inquiry.

Investigators working independently on the same problem are naturally apt to attach different values to the same phenomena. It is not surprising that I saw a number of things in a somewhat different light than Dr. Lindner did. In regard to epithelial phagocytosis, a process which Lindner refers to quite a number of times in his 1921 article, I was surprised not so much by what he stated about it, as I was by what he failed to state. It gradually dawned upon me as I studied this phenomenon day by day, that Dr. Lindner had missed the great import of it. One piece of evidence is the total lack of reference to it in a short summarizing paragraph on page 772 of that article, which translated reads as follows: "The knowledge of the dense growth of bacteria on the epithelial cells, the character of the pathogenic bacteria of the conjunctiva as parasites of the conjunctival epithelium is, so to speak, the essence of these new findings." I finally said to Dr. Lindner one day (my notes of the week of March 17, 1924 contain a report of the conversation verbatim), "Why did you pay so little attention to the process of epithelial cell phagocytosis in your articles?" He replied, "I confess that I failed to understand the importance of it until you came, and only brought it in incidentally with my findings on parasitic germs. I am very sorry now. You must explain it fully in your paper." The opportunity was therefore given to me to describe and explain the phenomenon of epithelial phagocytosis in detail, both the process of ingestion and of digestion of bacteria; to point out its significance in the realm of pathology and to suggest that it probably also occurs as a regular process in the fight against invading bacteria in some or all of the other body mucous membranes.

What is stated above does not in the least detract from the honor due Dr Lindner. It is my desire only to magnify that honor and to emphasize the great debt which ophthalmologists, and others engaged in the science of medicine, owe to him.

I further desire to add, that I should have stated in my paper that Dr. Lindner took all of the photomicrographs for me, with the apparatus that belonged to Professor Dimmer's clinic. The only part I played in it was to stick by him in that tedious task, which lasted on a number of occasions far into the night. It is a pleasure to express here my gratitude to Dr. Lindner for this important service.

In my paper I use the word "phagocytated" several times. The construction of this verb is incorrect. It should read "phagocytosed."

HARVEY J. HOWARD.
Peking Union Medical College.

To the Editor:

I beg you to be so kind as to insert in the AMERICAN JOURNAL OF OPHTHALMOLOGY that phagocytosis of the epithelial cells was by me in the year of 1909 published in my work on "Die Chlamydozen oder Trachomkörperchen und andere eigenartigen Körperchen, Epithelzelleneinschlüsse." v. Graefe's Archiv für Ophthalmologie v. 73, Heft 1, 1909, pp. 175-183. (Illustrated.)

Here I spoke not only of the "Trachomkörperchen, but also of the "epithelial phygocytosis of bacteria, and of different cells, even leucocytes. On page 182 I said: "Most interesting in these cases is the phygocytosis of the epithelial

cells. In many epithelial cells I have seen polynuclear leucocytes."

I remain yours truly,
Prof. Dr. C. Pascheff.
Sophia, Bulgaria.

To the Editor:

In the December number of the AMERICAN JOURNAL OF OPHTHALMOLOGY, Dr. W. C. Finnoff, in writing of Dr. Howard's article says: "By Lindner's method of making epithelial smears, etc." In the Ophthalmic Record of January 1912, in a short article entitled, "A New Method of Making Film Preparations to Demonstate the Presence of the Gonococcus," the following appears: "When a film was prepared so that the epithelial cells could be examined, masses of organisms identical in morphology with the gonococcus were found within them." The details by the method of making the epithelial smears, and staining by Giemsa are then given. "The usefulness of this method of preparation has been verified in Pneumococcus, and Diplobacillary conjunctivitis, altho it is extremely rare in the latter for the old method to give negative results. I feel sure that this method of preparing films showing epithelial cells, will demonstrate the presence of the gonococcus in many cases, which by the old method would have been negative." I did not take up the question of epithelial cell parasitism, or phagocytosis.

S. Hanford McKee, M. D.
Montreal.

BIOGRAPHIC SKETCH.

Sir Anderson Critchett.

1845-1925

American ophthalmologists share with their confréres of Great Britain in the sorrow caused by the death of Sir Anderson Critchett, and join with them in their tributes to the memory of this distinguished ophthalmic surgeon.

His kindliness and courtesy, his sympathetic and stimulating interest in the welfare of those with whom he was associated were outstanding features in his character; he possessed the indefinable powers of charm; he will be missed as few men are.

The brief memoir which follows, written by Mr. Leslie Paton, well and faithfully portrays the achievements of his fine career.

G. E. de Schweinitz.

SIR ANDERSON CRITCHETT, Bart., K. C. V. O., F. R. C. S. E., Surgeon Oculist to the King, whose death took place on Monday, the 9th of February, after a short illness, was the doyen of British ophthalmologists. Not only could he look back on a career of over fifty years as an ophthalmic surgeon himself, but as a successor to a distinguished father he was a link with the founders of modern ophthalmology. Sir William Bowman, Jonathan Hutchinson, George Lawson and George Critchett were the great names in the ophthalmic world in the sixties and seventies of last century, and George Anderson Critchett, the son of the last named, was born in the atmosphere of ophthalmology and was approaching manhood at the time when the discovery of the ophthalmoscope produced a renaissance in the study of diseases of the eye. "La reputation d'un père est un lourd fardeau pour le fils." But in the case of Anderson Critchett, great tho his father had made the name, he undoubtedly added to its repute, and it is safe to say that there are few names of British ophthalmic surgeons better known in the world at the present time.

He received his early education at Harrow and retained to the end the greatest love and pride in his old school. The cheer with which he was greeted when he went to Harrow on Speech Day in the summer of 1908, after he had been made a Baronet gave him more happiness than almost any other recognition of that honor. At Harrow he won the prize for English Literature and tho he did not actually gain a place in the XI, he laid the foundations of a good cricketing style which served him well when, later on, he went up to Caius College, Cambridge. At Caius he captained the cricket XI and made many friends. He graduated in 1867 and immediately after began to study medicine at the Middlesex and qualified in 1872. There followed a period in his career when it seemed almost doubtful whether medicine or music should claim him. He possessed a fine baritone voice and a love for the drama and social qualities which

all acted together to draw him away from the serious profession of medicine. His affection for his father and his desire to be of assistance to him proved an effective counterbalance to these attractions and from that time onwards he seriously devoted himself to the study of ophthalmology. He speedily began to acquire a wide reputation and it is of interest to note that his first published paper on "Inoculation in Ophthalmic Practice" was published in a French Journal—"Annales d'Oculistique" in 1877.

In 1881 he was elected out of a strong field of candidates Ophthalmic Surgeon to St. Mary's Hospital and it was his work there that finally established his reputation and incidentally built up one of the biggest eye clinics at any of the general hospitals in London. Critchett himself would be the first to recognize how much he was aided in his work at St. Mary's by the late Henry Juler and how loyally they worked together when a few years later Juler was coopted as his colleague.

His career from now onwards is a simple record of increasing honors accorded to him. In 1889 he was elected President of the Ophthalmic Section of the British Medical Association. In 1894 at Edinburgh and again in 1899 at Utrecht, he was elected honorary President of the International Ophthalmological Congress. From 1899 to 1901 he was President of the Ophthalmological Society of the United Kingdom. He became Surgeon Oculist to King Edward VII in 1901 and was knighted in the same year. In 1905 King Edward created him a Commander of the Victorian Order and in 1908 he was raised to the rank of Baronet. In 1912, when a new section of Ophthalmology was started in the Royal Society of Medicine he was the first President. In 1913 he was President of the section of Ophthalmology of the International Medical Congress at London and in 1918 on the foundation of the new Council of British Ophthalmologists he was elected the first President of that body. And in 1919, in recognition of his war services to King George the V Hospital, he was made a Knight of Grace of the Order of St. John of Jerusalem, and in the same year was created a K. C. V. O. Last year, 1924, he was elected Master of the Oxford Ophthalmological Congress, of which body he had previously been Honorary Treasurer. Thus, apart from the honors he received from the King, he has held every honor it was possible for his colleagues to confer on him. Such a record by itself must show the esteem in which Sir Anderson Critchett was held by those best able to judge of his work, an esteem which could only be earned by the genuineness of character which gave rise to it.

He was never a prolific writer, to the regret of many of his pupils, and much of his teaching, which would have been of great value, is lost for want of recording, but he was a great clinician and unrivalled as an operator. To see Critchett removing a cataract in the heyday of his skill was to see the perfection of operative technic. Never a hurried or purposeless movement was made and if any untoward complication had to be met, it was faced with the same steady placidity as if it had been foreseen from the first. He had to a very high degree the most valuable capacity of arousing in his patients an implicit feeling of confidence and the equally valuable capacity of creating a feeling of friendship in his colleagues.

To few men has it been given to have such a happy and such a full life; happy in his work, happy in his friendships and happy beyond expression in his family life, he reached the end of his long term of years without ever growing old.

ABSTRACT DEPARTMENT

Reprints and journal articles to be abstracted should be sent to Dr. Lawrence T. Post 520 Metropolitan Building, St. Louis, Mo. Only important papers will be used in this department, others of interest will be noticed in the Ophthalmic Year Book.

Horvath, B. Examination of Trachoma of Cornea With Slit Lamp. Klin. M. f. Augenh., 1924, v. 72, p. 649.

Horvath found in the cornea of fifty cases of trachoma with incipient pannus, small infiltrations with sharp borders, composed of fine dots, toward which a vascular loop ran. After this has reached the infiltration, it forms a glomerulus, from which occasionally two vessels proceed to another infiltration, forming there another glomerulus. After quite a long time, the peripheral infiltrations become dense and invade the deeper corneal tissue, in the superficial layers of which a depression is formed. Later the epithelium sags and presents the aspect of a facet. But also in some cases of trachoma, in corneae which appeared perfectly healthy to the naked eye, the author found disseminated small infiltrations, which were stained green by fluorescein. These investigations showed that the corneal epithelium is not healthy and that these defects may be the portals of entrance for the virus. He never found the infiltrations in healthy cornea, but similar ones in catarrhal ophthalmia and lymphatic conjunctivitis.

C. Z.

Mills, Lloyd. Ocular Changes With Preeclamptic Symptoms. Am. Jour. of Obstet. and Gynec., 1924, 7, 304-310.

In 1908, Erdheim and Stumme showed that in women who had never been pregnant, the average weight of the hypophysis was 6.15 grams and the maximum 7.5 grams; while in primiparae, the average weight was 8.47 grams and the maximum 16.5 grams.

Mills states that the eyes are involved in 90% of all cases of pregnancy by this normal hypertrophy of the pituitary gland, and that in 40% of these the involvment is of considerable importance. About 30% show a contraction of the visual fields of over 20 degrees. The changes in vision usually come on after the seventh month and are at a maximum at the time of parturition. After parturition, in the majority of cases, the hypertrophy immediately subsides and the visual fields correspondingly enlarge. However, persistent bitemporal hemianopsia, partial optic atrophy and neuritis have been reported, due probably to cystic or adenomatous changes in the hypertrophied pituitary.

Mills reports a case in which rapid constriction of the visual fields occurred shortly before the onset of labor. About six hours after delivery, vision was reduced to perception of moving objects and of light, in the right and left eyes respectively. The patient was otherwise normal. There was no improvement for eight days. Then the sight gradually improved and was normal in three weeks. When the author saw the patient three and a half months later, there were no residuals in the vision or visual fields and the fundi were normal except for slight fullness and tortuosity of the retinal veins. Mills believes that in this case the enlargement of the pituitary interfered with the venous drainage thru the optic nerve sufficiently to produce a rapidly arising edema of the optic nerve and retina which was enough to reduce vision markedly but not enough to give rise to hemorrhages, exudates or "real neuroretinitis."

According to Mills, the local pituitary pressure and the hyperfunctioning of the enlarged gland may be responsible for the headaches, nausea and vomiting and epigastric and colonic discomfort which often accompany these cases of visual defects in the later months of pregnancy. Thus, pituitary hypertrophy probably accounts for a number of the reported cases of preclamptic symtoms with visual disturbances and normal urinary findings which never progress to eclampsia.

H. P. W.

Bailliart, Magniel and Saragea. Comparative Measurements of the Retinal Arterial and Cerebrospinal Pressure in Arterial Hypertension. Arch. des Mal. du Coeur., etc., 1924, 17, 289-294.

A visible retinal arterial pulse, either spontaneous or induced, indicates that

the pressure of the ocular media has become equal to the local arterial diastolic pressure; the subsequent disappearance of the pulse indicates that the intraocular pressure has become equal to the arterial systolic pressure. The pressure necessary first to induce and then to abolish the retinal arterial pulse is determined on the dynamometer of Bailliart and the retinal arterial blood pressure is then estimated in millimeters of mercury according to a scale based on the tonometric tension of the eye. Normally the diastolic blood pressure in the retinal arteries is from 30 to 35 mm. Hg. and the systolic, from 60 to 65 mm. Hg. In cases of high arterial hypertension it is not satisfactory to attempt measurements of the systolic pressure as the instrument will not register over 150 mm. Hg. Normally the ratio of retinal to brachial diastolic pressure averages 0.45:1. In arterial hypertension, the retinal pressure rises relatively and the ratio becomes 0.50:1 or more.

In twenty-two cases of arterial hypertension, the average ratio of retinal to brachial diastolic pressure was 0.56:1. In four cases it was below 0.40:1. In one of these there was aortic insufficiency. In the other three, the low ratio was perhaps the first indication of a commencing obliteration of the local arterial system and of the probable subsequent onset of symptoms of cerebral deficiency. In several cases the ratio was from 0.70:1 to 0.96:1. In all of these there was an increased cerebrospinal pressure, tho this was not always proportionate to the increase in the ratio.

In all but one of the cases of hypertension in which lumbar puncture was done, the cerebrospinal pressure was found to be elevated, registering on the apparatus of Claude from 300 to 750 mm. water. On this apparatus, pressures above 240 mm. in the seated position are considered high. It has been found that a lumbar puncture of 5 to 10 c.c. of spinal fluid will reduce the cerebrospinal pressure by from 50 to 100 mm. water and will lower the general arterial blood pressure almost constantly by from 40 to 50 mm. Hg. It will also cause improvement in the headaches, nycturia, and other subjective symptoms. Care must be taken in performing the spinal puncture to avoid hemorrhage from the decompressed vessels in the spinal canal. The one case with low cerebrospinal pressure had had recent cerebral accidents. A few hours after lumbar puncture icterus with lowering of the arterial pressure developed and the patient died several days later.

The authors advance the suggestion that the increase in the cerebrospinal pressure may be the cause of the relative elevation of the diastolic blood pressure in the retinal arteries.

H. P. W.

Clark, J. Sheldon. Retrobulbar Optic Neuritis With Special Reference to Bacillus Subtilis Infections. Ill. Med. Journ. Nov., 1924, pp. 339-42.

A case of retrobulbar neuritis in which bacillus subtilis was found on several occasions in the spinal fluid is reported. From light perception in each eye the sight slowly increased to 20/20 in each eye under the usual treatment of the pilocarpin, sweats, mercury rubs to the temples, strychnin nitrate, etc. Tho the disease was ushered in with a cold in the head, the author did not find sufficient nasal trouble to think that sinusitis was a factor in causing the retrobulbar neuritis.

L. T. P.

Butler, T. Harrison. Focal Illumination of Eye With Special Reference to Clinical Use of Gullstrand's Slit Lamp. Brit. J. Ophth., v. 8, No. 12, 1924, p. 561.

As a prelude to the principle subject of the essayist's Doyne Lecture he discussed quite fully the valuable information to be obtained by the use of quite ordinary methods. The focused pencil of light from the ordinary source of a forty-watt, gas filled, electric bulb, together with the loupe and microscope, supplies an inexpensive apparatus which shows much that can be seen with the slit lamp. Yet the knowledge gained by the use of the slit lamp and corneal microscope has stimulated enormously the possibilities of observation by the less expensive methods. The essayist discusses what might be observed by focal illumination in the cornea, the blood circulation, the anterior chamber,the iris,

the lens and vitreous. Many illustrations accompany his descriptions.

In Gullstrand's slit lamp the principle of focal illumination reaches its highest development. By employing the pin hole we obtain a pencil of light which is very useful in the search for cellular elements in the aqueous and for demonstrating relucence of the aqueous. The writer discusses certain interesting and typical subjects which this wide field has opened by the use of the slit lamp. These are taken up under the subheadings of: inflammation, contusions of the eye, wounds, new growths and tuberculosis, glaucoma, pupillary membrane, suspensory ligament, cataracts, vitreous and retina. In all cases of lens examination the narrow beam must be used as it is not certain that the human lens would be tolerant. Many descriptions and beautiful drawings, illustrating the essayist's personal work in this field, accompany the contribution. The lecture should be read in the original.

D. F. H.

Graves, Basil. A Bilateral Chronic Affection of the Endothelial Face of the Cornea of Elderly Persons. Report to the Lang Clinical Research Committee, Royal London Ophthalmic Hospital. Brit. Jour. Ophth., v. 8, 1924, p. 502.

The condition described begins at or very near the central part of the deep face of the cornea, whence it spreads insidiously in a centrifugal direction. Twenty-two cases under observation for two and a half years, which were minutely recorded, are the basis of the observations. In no case was the period of time long enough to watch the transition from the early to the late manifestations. It is probable that the different cases recorded represent various stages in the same disease. It is convenient to divide it into four stages. The first consists of very fine appearances near the central endothelium. The second stage has a strikingly characteristic appearance of glinting points and endothelium studded with minute discrete clear cut dots. In the third stage the distribution is wider. Either the condition is uniform thruout a wider area, or the central region shows peculiar features while the marginal region shows punctate elements. Class four is similar to class three, but in addition there are changes in the corneal epithelium. Thirty-three diagrams, many illustrative case reports and much valuable instruction in the use of the slit lamp is contained in the contribution which should be carefully read in the original.

D. F. H.

Lang, Basil. Modification of the Usual Method of Needling the Lens Capsule After Cataract Extraction. Brit. J. Ophth. v. 8, 1924, p. 459-64.

The author believes that needling should be performed even if the capsule is thin, for its remote beneficial effect, usually about fourteen days after the extraction. In old capsules the incision does not gape well. Sepsis is avoided by touching the conjunctiva with a one per cent solution of silver nitrate. Secondary glaucoma may be largely avoided by preventing the blocking of the angle with vitreous. The author used a needle, the diameter of the shaft being 1 mm., the width of the blade being 1½ mm. The point of the needle is placed 4 mm. from the limbus opposite nine o'clock, the handle directed toward the head and the point toward the feet. With a side pressure toward the limbus, the conjunctiva is thrown into a fold. The handle is then rotated around, the blade on a plane with the iris and directed toward three o'clock. The blade is passed thru the limbus and onward just in front of the iris to the pupillary space. A thin piece of capsule is selected, never cutting a strand, piercing the capsule by passing the point backward and running the blade under the capsule and by depressing the handle cut the capsule a second time at about three o'clock. The blade is turned and cut upwards toward twelve o'clock and forwards into the anterior chamber. In order to divide the posterior capsule, the operation will have to be repeated, raising the handle quite considerably in order to pick it up. Only a small hole is necessary. Good light is essential. The advantages of this modification are: 1. It is easy. 2. It avoids the possibility of sepsis. 3. It obviates the possibility of glaucoma. 4. It eliminates the necessity of stirring up the vitreous.

D. F. H.

Heine, L. Clinical and Anatomic Study of the Healing Processes of Detachment of the Retina. Klin. M. f. Augenh., 1924, v. 72, p. 305.

Heine gives his observations on 120 eyes with detachment of the retina. In 20, no cause could be ascertained. Out of the remaining 100, myopia explained 37, trauma 26, cyclitis 15, tumor 7, choroiditis 6, diabetes 2, struma 1, retinitis 1, several causes 5. The explanation of detachment in myopia by stretching alone is not possible. Leber found shrinking membranes originating from the ciliary epithelium, probably also from the pigment epithelium. Heine thinks that in myopia, infections, especially tuberculosis, play a greater part than so far supposed. Deposits on Descemet's membrane, atrophy of the iris, partial and total, the socalled secondary iritis, considered as relapsing latent iridocyclitis, suggest this. Iridocyclitis may lead to detachment. As this is of a tuberculous nature in half the cases, from 7% to 8% of the above statistics of detachment are attributed to tuberculosis. Of the six cases of choroiditis, three were ascribed to lues. One case of retinitis was syphilitic and the grave bilateral amotio in diabetes began with retinal hemorrhages and retinitis.

Clinical healing processes, not complete recoveries, were found in 16 eyes of which 6 were due to myopia, 6 to trauma, 1 to choroiditis, 1 to retinitis (syphilitic), and 2 to unknown causes.

From an anatomic standpoint the etiology falls into the following classes. 1. Shrinking epithelial membranes on the external surface of the retina. 2. Shrinking epithelial membranes on the internal surface of the retina in 7 cases of myopia, in 3 of traumatic detachment. 3. Shrinking connective tissue formations on the inner surface of the retina with circumpapillary detachment and loosening of the ora serrata. 4. Shrinking connective tissue on the inner surface with detachment at the ora serrata and marked loosening of the retina at the disc in 2 cases of hemorrhagic glaucoma.

Anatomic healing processes were observed in 10 cases: 2 associated with malignant tumor; 2 albuminuric retinitis; 2 myopia; 2 contusion; 2 buphthalmus. The healing types with and without formation of strands, the distinction from chorioretinitic processes and the possibility of diagnosis from the anatomic conditions alone, are discussed.

C. Z.

Baer, A. Ocular Changes in Botulism. Klin. M. f. Augenh., 1924, v. 72, p. 675.

Three cases, two of which ended fatally, of botulism after eating American canned corned beef, are described. All presented decreased lacrimal secretion and ophthalmoplegia externa and interna and in one case retinal hemorrhages. There were some other peculiar features, so far not published, as disturbances of the sensibility of the fifth nerve, hyperemia of the disc, optic neuritis and central scotoma in one, in which there was less optic neuritis.

Anatomically were found degenerations in the nuclear region of the ocular nerves by infiltrations with fat granular cells, disintegration of the Nissl granules and chromatolytic changes. In the second case, transverse and especially longitudinal sections of the optic nerves showed intense infiltration with lymphocytes between the nerve bundles and partly of the nerve tissue in the retrobulbar portion.

This differs from postdiphtheritic lesions in that the pupillary reaction generally is undisturbed and mostly the abducens is affected, while paresis of the third nerve and total ophthalmoplegia are rare. In intoxication by methyl alcohol only the optical paths are damaged, never the motor apparatus. The participation of the ocular nerves and the more pronounced paralysis of accommodation in botulism distinguish it from intoxication, where occasionally general symptoms, as loss of consciousness, hallucinations and delirium are encountered.

C. Z.

Adie, W. J. Cataract in Dystrophia Myotonica (Myotonia Atrophica). Brit. J. Ophth., v. 8, 1924, p. 497.

In this contribution the author calls attention to a remarkable and by no

means very rare hereditary disease, in which cataract is a common and important symptom. The main features of the disease are muscular atrophy, myotonia and extramuscular symptoms especially cataract, atrophy of the testicles and baldness. In 1918, Fleischer showed that this syndrome represented but one aspect of a heredofamilial disease. A new kind of disorder is introduced into this group of diseases in the form of certain degenerative phenomena in parts outside the muscular and nervous systems. The fully developed disease is confined in the main to one generation, the dystrophic generation. The members of earlier generations do not as a rule suffer from muscular symptoms, but they often develop cataract which tends to appear at an earlier age.

The author has found records of over one hundred cases. In 66 of these, muscular symptoms and cataract were found together, cataract occurred alone in 17 members of the dystrophic degeneration in 18 parents, uncles or aunts; in 5 grandparents, and in one great-grand-parent. The sexes are about equally affected and transmission seems to take place thru males and females indiscriminately.

The character of the cataracts is not the same in the different generations; in patients with muscular symptoms and in their sibling, cataract, if it occurs at all, comes on at an early age (from the teens to the forties, most often between twenty and thirty-five); in the preceding generation it appears later but is still distinctly presenile in most instances, whilst in earlier generations it usually comes on in old age as ordinary senile cataract.

The author has seen twenty cases in London since 1919, and as the disease is always familial and as cataract occurs in some members of almost every affected stock, it is almost certain that the number of cases scattered thruout the country is a considerable one.

D. F. H.

Lang, Basil. A Modification of Extraction of Senile Cataract. Brit. J. Ophth., v. 8, No. 10, 1924, pp. 459–464.

It appears to the author that it would be greatly advantageous if the hole thru which the lens was to be delivered could be made as deep as possible in the antero-posterior direction. To quote the author's own words, "It is in this that my modification of the usual technic consists. Having completed a large section I lacerate the capsule with the cystitome. When operating on the right eye, I take a lens scoop in my left hand and the curette in my right. The patient looks down and I press the scoop flat on the sclera at the twelve o'clock position with its edge in contact with the wound. I press it backwards towards the center of the globe. The wound begins to gape. The vitreous forces the lens forwards against the under surface of the cornea. Further pressure makes the wound gape more and the lens begins to force the iris in front of it out of the wound. Still further pressure pulls the iris from over the front of the advancing lens, and the prolapse begins to be moulded to the shape of the edge of the lens. On further pressure the lens edge is seen to stretch the iris until it comes close up to the pupillary border. It is at this moment that for the first time I begin to apply pressure below with the curette against the cornea.

Owing to the scleral edge of the wound having been pressed backwards, the space thru which the lens has to escape is bigger than the lens. Sometimes before I have had time to apply the pressure with the curette, the lens begins to be born thru the pupil. At other times it appears to be caught up by the thickened pupillary border of the iris, but only the slightest pressure below is required to release it. I next follow the lens upwards slowly with the curette to the wound, maintaining the pressure on the scoop the whole time. The iris has thus never been subjected to pressure between the sclera and the lens and has apparently lost little, if any, of its muscular tone, for sometimes by itself, and in any case, on the slightest touch with the repositor or the stream from the irrigator it immediately returns within the eye and the pupil assumes a central position."

D. F. H.

Bloch, C. E. Blindness and Other Diseases in Children Arising from Deficient Nutrition. (Lack of Fat-Soluable A Factor) Am. Jour. of Dis. of Children, 1924, 27, 139-148.

Xerophthalmia was first described as occurring in the final stage of protracted wasting diseases such as tuberculosis, syphilis, typhoid fever, and acute and chronic digestive disturbances. It was supposed that it was caused by a lack of fat in the diet. It will arise, however, even tho the children are fed certain fats, such as margarine or pork fat. Fresh vegetables will not prevent it. Osborne, Mendel and McCollum showed that it was due to the absence from the diet of the fat-soluble A vitamin which is found in fresh milk, butter, cream and cod liver oil and which is necessary to growth.

According to Bloch, xerophthalmia is found to occur also in children under two or three years of age without any underlying disease, who have been deprived of milk and milk products or who have been fed stale or adversely modified milk. In these infants, the disease appears especially in the spring months, at which season the most marked growth of the child takes place and when, therefore, there is the most demand for the A vitamin. Cases occurring outside of the annual growth period and in older children have always been in the course of serious infections or diarrhea, when the demand for vitamin is very great, or after very prolonged deprivation from essential vitamin. A child on an essentially carbohydrate diet will sooner or later develop malnutrition with edema and possibly xerophthalmia. If, however, a little butter has been added to the diet, the edema will develop just the same but never the xerophthalmia.

In children who have been deprived of the fat-soluble A vitamin, there is first inhibition of growth, diminished resistance and increased susceptibility to infection. With the development of xerophthalmia, there is night blindness and dryness of the ocular conjunctiva. The dryness extends to the cornea which becomes hazy and shrivels. Pieces of the cornea then necrose and the stage of keratomalacia is reached. The ocular conjunctiva usually becomes infected so that the lids are swollen, the conjunctiva reddened and there is photophobia and lacrimation. If the cornea sloughs, panophthalmitis results. The cases can be cured by giving fresh milk, cream, butter or codliver oil. The xerophthalmia is the first symptom to disappear. If the child recovers, the corneal scars, always dense and opaque, will be of varying extent according to the area of the cornea which has been damaged. Useful vision can often be preserved.

Bloch says that six to seven hundred cases of xerophthalmia in children occurred in Denmark between 1909 and 1920 in a population of less than 3,000,000. The number of cases increased each year up to 1918 when butter was rationed so that every individual received 0.25 kilogram of butter a week. Then xerophthalmia practically disappeared. But it returned again in 1920 when the rationing was stopped.

H. P. W.

Riva. The Eye in Relation to Spinal Anesthesia. Arch. di Otto. vol. 31, p. 31, 1924.

A review of reported cases of injury to the eye by spinal anesthesia found in the literature reveals 36 cases of paralysis of the ocular muscles. Of these 27 affected the external rectus, 6 both external recti, 1 the fourth nerve on one side, and 1 both the sixth and third nerves on both sides. Since 1910 there have been few reports on the subject; one, however, recording a transitory amaurosis followed by permanent hemianopsia. The paralysis usually appeared within ten days after the anesthesia and recovered in from five to twenty-five days. The mydriasis is probably due to paralysis of the anterior nuclei of the third nerve which are located under the aqueduct of Sylvius and could thus be directly affected by the drug.

The amblyopia and hemianopsia can be explained as due to a selective toxic action of the drug on certain parts of the retina or optic pathways. In the case of the hemianopsia the lesion was probably in the optic tract in the neighborhood of the chiasm which could be reached by the drug thru the cerebrospinal fluid. Because of the different

opinions as to the diffusibility of stovain, the author carried out experiments with an artificial model of the cerebrospinal canal filled with physiologic salt solution. Stovain injected under conditions similar to those used in anesthesia, reached a position corresponding to the lateral ventricle in less than six minutes. Thus the lesions observed after anesthesia could easily be caused by the direct effect of the drug on the nuclei of the nerves or the nerves themselves. To determine the frequency of slight danger to the visual organ after spinal anesthesia, the author submitted fifty cases in which it was used, to careful examination of the ocular motility, field of vision, accommodation and light sense. Each case was examined three times; before the operation, three to eight hours afterward, and ten days afterward. No definite evidence of damage to the optic nerve or the motor apparatus was found in any of the cases in the author's series.
S. R. G.

Thies, O. Metastases in Staphylococcus and Streptococcus Sepsis. Klin. M. f. Augenh., 1924, v. 72, p. 382.

Two cases of staphylococcus sepsis with metastasis in the limbus and seven cases of streptococcus sepsis, one with bilateral metastatic retinitis, five with metastasis in the orbit, are reported. Five ended fatally. The staphylococcus metastasis in the eyes were less violent, locally confined and favorably influenced by treatment, while streptococcus metastasis set in very violently with extended orbital phlegmon and in almost all cases very severe diseases of the inner tissues, with metastatic ophthalmia and destruction of the eyeballs. The author recommends early injections of serum, even if only a slight result may be hoped for.
C. Z.

Blatt, N. Metastatic Episcleritis. Klin. M. f. Augenh., 1924, v. 72, p. 386.

A boy, aged 14, developed two weeks after staphylococcus angina tonsillaris, a swelling of both lids and a yellowish-red circumscribed, soft tumor about 5 mm. below the lower limbus. This broke thru the next day under hot applications and three purulent necrotic cores appeared which, however, did not follow traction with the forceps till six days later, after which the wound healed. Microscopically, the purulent nodules contained leucocytes with polymorphous nuclei, staphylococci and pneumococci. The affection very much resembled a furuncle of the skin which probably also had its portal of entrance in the tonsils. The blood did not contain staphylococci. In general, the prognosis is favorable. The severe course in this case was probably due to the mixed infection with pneumococci.
C. Z.

Comberg, W. Observations on the Vitreous Body. Klin. M. f. Augenh., 1924, v. 72, p. 692.

Recently, Baurmann furnished the ultramicroscopic proof of structures which showed the colloid nature of the vitreous. The investigations of Comberg corroborated this. The vitreous probably has the structure of an ultramicroscopic sponge in which a part of the fluid is held as colloid and a part is contained in the extremely fine pores. Slit lamp examination confirmed this and indicated, by the behavior of the vitreous in ocular movements, incipient liquefaction. Stratification can be observed in prolapses of the vitreous into the anterior chamber. Such prolapse is almost a regular occurrence after discission and its tendency to greater extension suggests that great care should be used in this operation. After injuries at the equator and back of it, very fine strands are found with the slit lamp which are not visible by simple transillumination. It is not impossible that they may have great importance as the origin of detachment of the retina.
C. Z.

Filatow, W. P. Technic of Total Keratoplasty. Klin. M. f. Augenh., 1924, v. 72, p. 423.

Filatow worked out a new method which he employed on a case with large staphyloma of both eyes and vision of light perception. Under cocain anesthesia, four punctures were made with von Graefe's knife near the

apex of the staphyloma of the left eye. Thru these, one blade of a pointed scissors was introduced in the direction of the limbus. Four triangular windows with the bases to the limbus were excised, leaving a cross of staphyloma tissue. The cornea from an enucleated eye was introduced thru the lower temporal window. Here the conjunctiva bulbi was pulled over the window and fastened with a thin suture to the cross. After a period of slight opacity, the cornea became clearer and the patient saw motion of hands. The bands of the cross lay close to the cornea, holding it in place, like a lattice and gradually became adherent to it. After seven months the cornea was converted into a flat leucoma, the vision reduced to perception of light.

After the same operation on the right eye, about the same result was observed, vision remained the same with correct projection. The author thinks that both eyes could be used for partial transplantation, the staphylomas being converted into flat leucomas. The formation of connective tissue behind the cornea is a disagreeable complication which has to be considered in total corneal transplantations. C. Z.

Blatt, N. The Question of Eye Transplantations. Graefe's Arch. für Ophth. 1924, v. 144, p. 47.

The author repeated experiments similar to those of Koppanyi. He undertook transplanting eyes in 400 fresh water fish, 80 rabbits and 40 young fowls. Among the 400 experiments performed on fish, he succeeded, in 26 cases, in obtaining anatomic healing of the transplanted eye; of the experiments on rabbits two were successful and among the fowls there were only failures to record. Trials also were made in all three varieties of animal in which the eye was removed and then replaced in the orbit from which it had been taken (replantation). This variety of operation gave the same negative results.

Elimination of the eyeball in cases in which the transplant failed to live occurred oftenest on the second or third day after operation.

In one case on the fourth day it was noted that the transplant was nourished. In successful cases there were short, irregular movements in the muscles which had been transplanted together with the eyeball which, however, could not be compared with the purposeful movements of the normal eyeball. None of the fish with transplanted eyeballs had vision.

Of the 80 experiments in eye transplantations in rabbits, only two were successful in so far as anatomic healing of the grafted eye was concerned and in these there was no recovery of sight.

A discussion of the status of eye transplantations is contained in the article. St. John.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply news from their respective sections: Dr. Edmond E. Blaauw, Buffalo; Dr. H. Alexander Brown, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. Robert Fagin, Memphis; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. Geo. F. Keiper, LaFayette, Indiana; Dr. George H. Kress, Los Angeles; Dr. W. H. Lowell, Boston; Dr. Pacheco Luna, Guatemala City, Central America; Dr. Wm. R. Murray, Minneapolis; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. John E. Virden, New York City; Dr. John O. McReynolds, Dallas, Texas; Dr. Edward F. Parker, Charleston, S. C.; Dr. Joseph L. McCool, Portland, Oregon; Dr. Richard C. Smith, Superior, Wis.; Dr. J. W. Kimberlin, Kansas City, Mo.; Dr. G. McD. Van Poole, Honolulu; Dr. E. B. Cayce, Nashville, Tenn.; Dr. Gaylord C. Hall, Louisville, Ky.; Dr. Edward D. LeCompte, Salt Lake City.

DEATHS.

Dr. Adolf Schenkl, Prague, died recently, aged 83.

Dr. Roscoe C. Wilson, Ithaca, N. Y., age 55, died Jan. 18, following an operation.

Dr. William A. Hollis, Hartford City, Ind., age 46, died Jan. 16, of heart disease.

Dr. Julius Hirschberg, emeritus professor of ophthalmology, Berlin, died recently, aged 82.

Dr. Samuel E. Allen, Cincinnati; age 60, died Jan. 14, of pneumonia.

Agusto von Reuss, aged 83, died recently in Vienna.

Professor Francesco Ghilarducci died in Rome, in October, 1924.

Dr. Henry Burt Stevens, Boston, aged 55, died January 31, 1925, of pneumonia.

SOCIETIES.

The eighth annual meeting of the Indiana Academy of Ophthalmology and Oto-Laryngology was held at Indianapolis January 21-22, 1925, president B. J. Larkin, presiding.

At the meeting of the Central Illinois Eye, Ear, Nose and Throat Society, held in Champaign, Dec. 2, 1924, Dr. Thomas J. Carmody of Danville was elected president and Dr. Frank L. Alloway of Champaign, secretary.

At a recent meeting of the New York Ophthalmological Society, the following officers were elected: Dr. Henry H. Tyson, president; Dr. W. G. Reynolds, vice-president; and Dr. John H. Dunnington, secretary and treasurer.

The Chicago Ophthalmological Society and the Chicago Laryngological and Otological Society held a joint meeting at the Great Northern Hotel, March 2-3. Clinics were held in various hospitals on both days.

The officers of the Sioux Valley Eye and Ear Academy elected January 19 at Sioux City, Ia., for the ensuing year were: Dr. Louis B. Bushman, president; Dr. Frederick Bailey, vice president; and Dr. Frederick H. Roost, secretary.

The middle section of the American Laryngological, Rhinological and Otological Society met in Lafayette, Indiana, February 23rd under the chairmanship of Dr. George F. Keiper of Lafayette. A full program was enjoyed.

At the Clinical Congress of the American College of Surgeons held February 16-17 at Louisville, Ky., Dr. Edward Jackson gave addresses on "Surgical Principles Applied and Illustrated in Cataract Operations" and "Safety First in Using Your Eyes."

At the February meeting of the Section on Ophthalmology of the College of Physicians of Philadelphia, the following program was presented: Dr. Burton Chance, "First Book Printed on Diseases of the Eye." Dr. Wm. C. Posey, "The Report of an Unusual Case of Orbital Abscess in an Infant." Dr. Luther C. Peter, "Presentation of a Model for Demonstrating Normal and Abnormal Motility of the Ocular Muscles." Mr. Basil Graves, London, (by invitation), "A Variety of Injury to the Lens Detectable only by the Slit Lamp."

At the Kansas City Eye, Ear, Nose and Throat Society, February 19, 1925 cases were presented on Postoperative Symblepharon, by Dr. T. S. Blakesley; Postoperative Plastic Nasal Work by Dr. Sam. E. Roberts; Fractured Skull followed by Lateral Sinus Thrombosis, Dr. O. J. Dixon; Muscle Imbalance, Dr. H. B. Hedrick. The paper of the evening on "Some Varieties of Muscle Imbalance" was read by Dr. O. P. McCartney. Discussion opened by Dr. L. R. Forgrave. Dr. Thomas E. Wyatt reviewed the literature of 1924 on "What is new in ear, nose and throat work."

At the annual meeting of the Indiana Academy of Ophthalmology and Oto-Laryngology the following officers were elected: President, Dr. M. Ravdin, Evansville; First Vice President, Dr. R. E. Repass, Indianapolis; Second Vice President, Dr. A. B. Knapp, Vincennes; Secretary-Treasurer, Dr. D. S. Adams, Indianapolis; Council, Drs. B. W. Egan, Logansport, and W. S. Tomlin, Indianapolis. The next meeting will be held at Evansville in 1926.

At the regular meeting of the Ophthalmological-Oto-Laryngological Section of the Cleveland Academy of Medicine, January 30, 1925, Dr. Justin M. Waugh read a paper on "A Series of Pathologic Growths of the Larynx and Throat," with a lantern slide demonstration. Dr. S. C. Lind, on "Fracture of the Larynx"; Dr. P. C. McDowell, recently returned from Teheran, Persia, where he has been superintendent of the

American Hospital for the past six years, talked informally on "Persian Ophthalmology." Dr. A. D. Ruedemann presented an instructive and interesting case report of "Sarcoma of the Choroid" recently seen by him in the Cleveland Eye Clinic.

The Belgian and French Societies of Ophthalmology will hold their Thirty-eighth Annual Congress in Brussels from the 9th to the 14th of May, 1925. Thru the courtesy of the President, Prof. Gallemaerts, a cordial invitation is extended to the members of The American Academy of Ophthalmology and Oto-Laryngology to be present. The subscription price is 60 Belgian francs. Those who wish to subscribe to this Congress should forward their application, together with the registration fee, to the Secretary, M. le Docteur Danis, 7 Rue Montoyer, Brussels, Belgium.

LUTHER C. PETER, Secretary
AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY.

A joint meeting of the China Medical Association and Hongkong Branch of the British Medical Association was held in Hongkong, Jan. 21-23, 1925. The following is the program of the Section of Ophthalmology:

Chairmen: H. J. Howard of Peking and G. M. Harston of Hongkong.

First Session—Wednesday, January 21, 1925.

Symposim on Cataract: Choice of operation in extraction of cataract, G. M. Harston (Hongkong); Block akinesia of the lid sphincter in intraocular operations, (illustrated), H. J. Howard (Peking); The use of and the indications for a conjunctival bridge or sclerocorneal suture in extraction of cataract (illustrated).

Second Session: Thursday, January 22, 1925.

Echinococcus cyst of the orbit, (illustrated), H. J. Howard (Peking); Extensive tuberculosis of an eye in an infant, (illustrated), T. M. Li (Peking); The finding of miliary tubercles in the choroid in autopsy specimens, T. P. Lee (Peking); Spontaneous trephining in glaucoma, (illustrated), H. J. Howard (Peking); The value of milk injections in the treatment of gonorrheal ophthalmia, D. V. Smith (Peking); and The status of milk injections in ocular therapeutics, H. J. Howard (Peking).

Third Session—Friday morning, January 23, 1925.

The treatment of symblepharon and recurrent pterygium by Hay's operation, W. S. Thacker-Neville (Changsha); The diagnosis and treatment of symblepharon, R. A. Peterson (Chengta); Fundus changes in kala azar patients, (illustrated), W. P. Ling (Peking); The treatment of ocular syphilis by neotrepol, G. M. Harston (Hongkong); Acute retrobulbar neuritis and a report of 4 atypical cases, (illustrated), T. Y. Lai (Peking); Plasmoma of the conjunctiva (a preliminary report, illustrated), P. S. Soudakoff (Peking); An anomalous duct from the lacrimal gland, (illustrated), W. P. Ling (Peking); Trachoma in China, H. J. Howard (Peking).

Fourth Session—Friday afternoon, January 23, 1925.

An illustrated lecture on the epithelial cells of the conjunctiva in relation to parasitic bacteria and trachoma bodies, H. J. Howard (Peking).

A personal letter states, "The warfare in China prevented a larger attendance. In fact, those of us from Peking had a difficult time in reaching Hongkong. It took us ten days merely to go one way and will take us as long to go back. But there have been many compensations for our hardship.

"This conference is important also in that it marks the beginning of the participation of Chinese ophthalmologists in our biennial meetings."

PERSONALS.

Dr. Gonzáles Selong has been sent to Egypt by the Argentine government to study trachoma.

Dr. Marius Tscherning retired recently from the Chair of Ophthalmology, Copenhagen, after reaching the age limit.

Dr. F. J. Pinkerton of Honolulu will spend about four months in postgraduate work in some of the large clinics on the mainland.

Dr. Walter B. Lancaster and family and Dr. Allen Greenwood and family of Boston spent the month of February at Clearwater, Fla.

Dr. and Mrs. Melville Black of Denver are taking the Mediterranean cruise and will return about May 1st.

A complimentary dinner was tendered Dr. Wendell C. Phillips, February 7, at the Fraternity Building, New York, on the occasion of his retirement from active service at the Manhattan Eye, Ear and Throat Hospital.

Dr. Joseph D. Lewis late surgeon in chief, eye, ear, nose and throat, Minneapolis General Hospital, announces the removal of his offices to Suite 421 San Marcos Building, Santa Barbara, California.

Lieut.-Col. Harry Vanderbilt Würdemann, Seattle, Washington, has been ordered to general staff duty in Washington, D. C., for the period from March 11th to April 20th. While in Washington Col. Würdemann will serve on a Committee on National Defense, which will consider plans and policies with respect to the organization and training of the Organized Reserves. In this duty he will represent the 9th Corps Area, comprising Washington, Oregon, Idaho, Montana, Wyoming, Utah, Arizona and California.

The Regents of the University of Minnesota have conferred upon Dr. John F. Fulton of St. Paul, the title of Emeritus Professor of Ophthalmology. Announcement of the above made at a dinner of the Minnesota Academy, brought forth an outburst of applause with every man attending in-

stantly upon his feet in a most impressive demonstration. Dr. Fulton was the first, or one of the first two teachers of ophthalmology in the Medical School, and for many years was the leading ophthalmologist in the Northwest.

MISCELLANEOUS.

Courses have been arranged at the Massachusetts Eye and Ear Infirmary on the use of the Gullstrand Slit Lamp, to be given during March by Dr. L. Koeppe.

On February 15, the time limit set for raising the fund to establish the Wilmer Eye Institute at Johns Hopkins University, Baltimore, announcement was made that the total amount, $3,000,000 had been subscribed. Among large gifts to this fund were $100,000 from J. P. Morgan and $50,000 each from Frank A. Munsey, Julius Rosenwald and Felix Warburg.

New York Association for the Blind announces that plans have been prepared for a $250,000 building for settlement work among the blind, to be erected on the site of the old "Lighthouse," and an adjoining lot at 111 E. 59th street.

The Permanent Blind Relief War Fund, 730 Fifth avenue, New York, announces several English books in Braille, and between forty and fifty French titles. These are for distribution to libraries with departments for the blind, requests for the war blind being given preference.

Optometrist Fred Watson, secretary of the California Optical Company, claims to hold a certificate from the State Board of Education to examine the eyes of children in the public schools. Upon a recent trip to Pittsburg, Calif., he is said to have examined about 200 children. The examinations were free, so far as the children are concerned, being paid for by the association of optometrists.

Current Literature

These are the titles of papers bearing on ophthalmology. They are given in English, some modified to indicate more clearly their subjects. They are grouped under appropriate heads, and in each group arranged alphabetically, usually by the author's name in **heavy-faced type.** The abbreviations mean: (Ill.) illustrated; (Pl.) plates; (Col. Pl.) colored plates. Abst. shows it is in an abstract of the original article. (Bibl.) mean bibliography and (Dis.) discussion published with a paper.

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FIGURE 1

INFLAMMATORY TUMOR OF BROW (REESE). (HEMATOXYLIN AND EOSIN STAIN.)

A. PIECE OF HEALTHY EPIDERMAL EPITHELIUM LYING ON THE SURFACE OF THE CAPSULE.

B. PIECE OF EPIDERMAL EPITHELIUM THE VIABILITY OF WHICH IS IMPAIRED.

C. NECROTIC EPIDERMAL EPITHELIUM.
B. REPRESENTS AN INTERMEDIATE STAGE BETWEEN A. AND C.

D. CONNECTIVE TISSUE CAPSULE WITH AN INCLUSION OF NECROTIC EPITHELIUM WHICH CONTAINS A "PEARL" OF CORNIFIED SUBSTANCE.

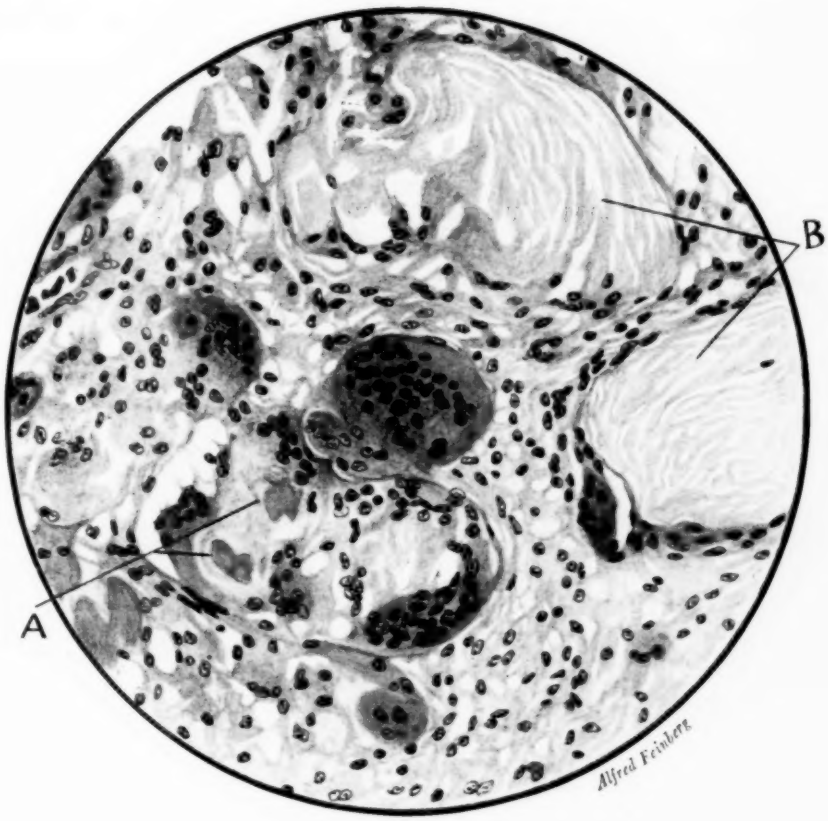

FIGURE 2

INFLAMMATORY TUMOR OF BROW UNDER HIGH POWER. (HEMATOXYLIN AND EOSIN STAIN).

A. NECROTIC EPITHELIUM, MOST OF WHICH HAS BEEN DISSOLVED BY THE FOREIGN BODY GIANT CELLS SURROUNDING IT. IN THE IMMEDIATE CENTER OF THE FIGURE IS AN ENORMOUS FOREIGN BODY GIANT CELL WITH OVER 50 NUCLEI

B. TRABECULAE OF NECROTIC EPITHELIUM, SURROUNDED BY FOREIGN BODY GIANT CELLS AND EPITHELIOID CELLS.